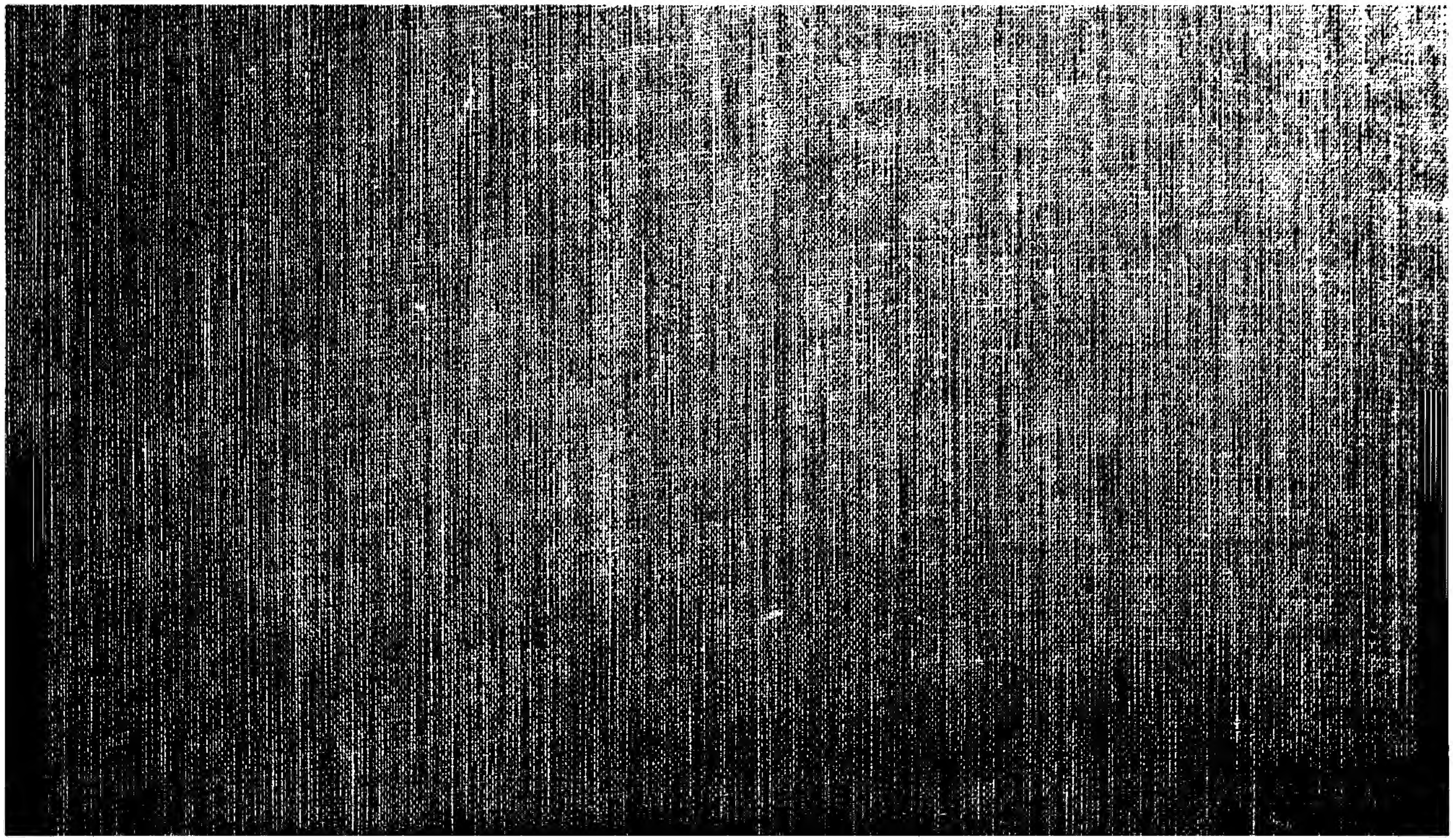

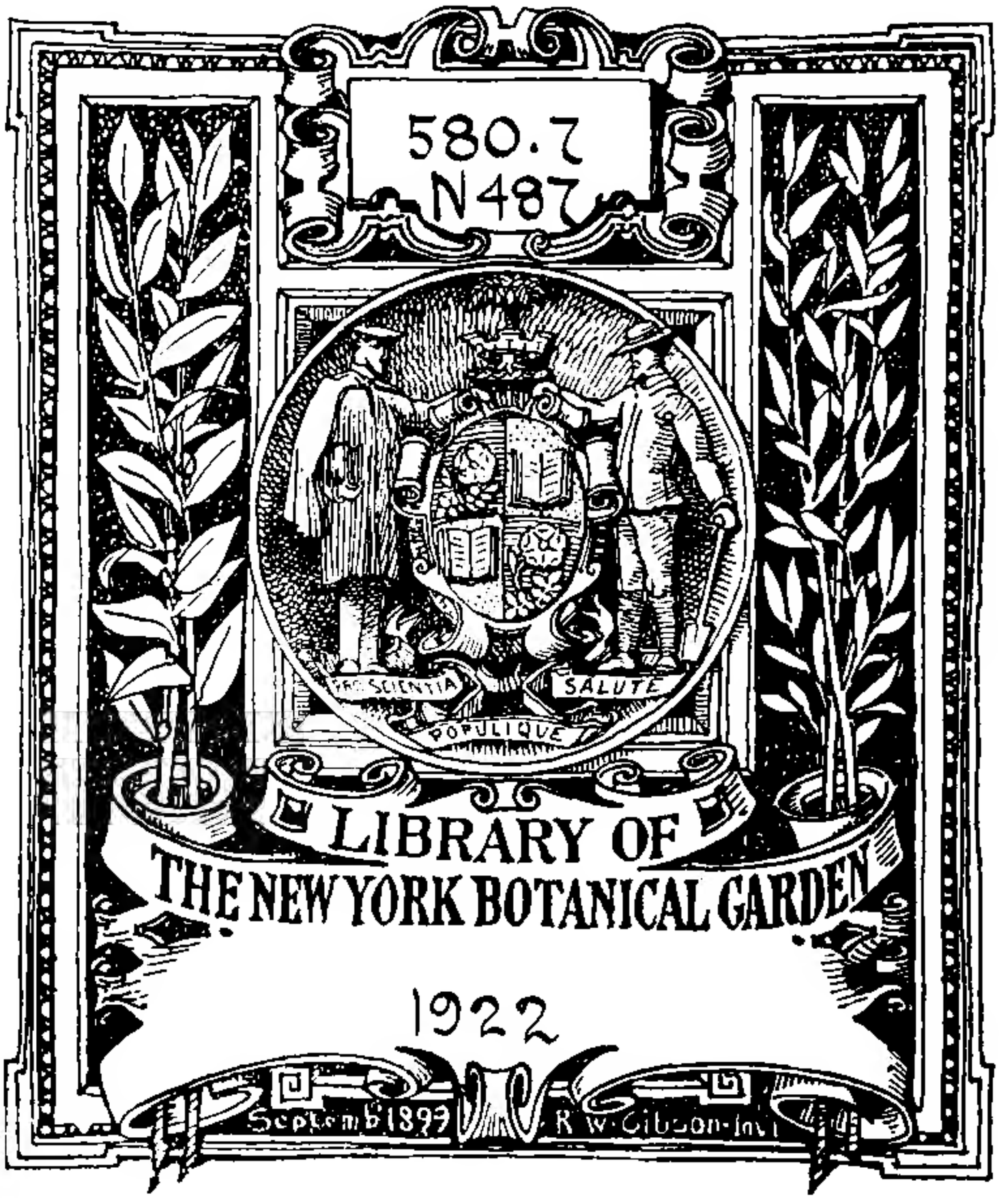
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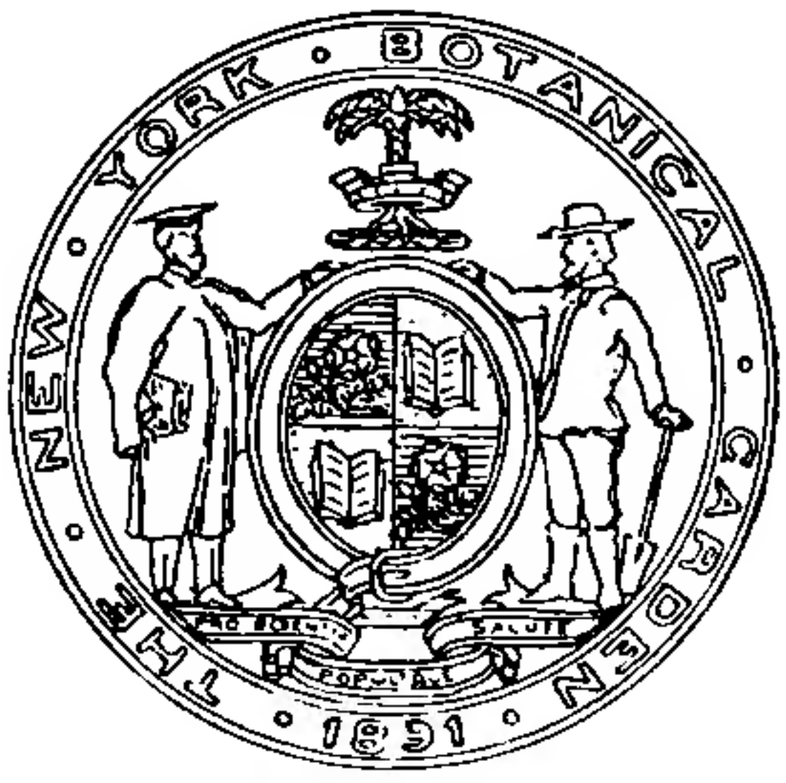

VOLUME XXIII

WITH 15 PLATES

1922

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AT 8 WEST KING STREET, LANCASTER, PA.
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Paulownia tomentosa. Reproduced from photograph of tree in New York Botanical Garden, taken in Feb. 1922.

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OF

The New York Botanical Garden

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PAULOWNIA IN WINTER

WITH PLATES 267 AND 268

Paulownia tomentosa or *P. imperialis*, under each of which names it is known, is a conspicuous tree at all seasons, especially in spring, by reason of the panicles of purple, fragrant, trumpet-shaped flowers that are in full bloom before the appearance of the leaves, and in summer, when the broad, velvety leaves have reached their full size[1]. Later, in autumn, the clusters of ovate seed pods stand out prominently in connection with the naked branches, so that throughout the entire period of seasonal growth some one striking feature is always apparent. During winter, also, when flowers, leaves, and most of the seed-pods have disappeared, it is still conspicuous among all other deciduous trees in this region because of its erect, branching, terminal panicles of velvety-brown flowers buds, often a foot or more in length, that can hardly fail to attract the attention of even a causal observer.

These winter-bud panicles, which are actually formed late in the preceding summer, are particularly interesting because they are not contracted into single, closely compacted, winter buds, such as we are familiar with in connection with nearly all of the trees and shrubs in this latitude, as in the lilac for example (Plate 268, fig. 2), which expand in the following spring and

[1] The leaves, more particularly those borne upon saplings and young vigorous shoots, are larger than those of any other species of tree in this latitude and are strikingly suggestive of tropical foliage. A beautiful example of a tree showing this character, growing a short distance southeast of the museum building, was described and figured in the *Journal* for January 1907.

gradually develop into flowering panicles. The winter-bud stage of *Paulownia* is represented by a fully developed panicle (Plate 268, Fig. 1), of which each individual embryo flower consists of an adequately protected bud, so that the entire panicle is prepared to burst at once into full blossom when the proper time arrives. The interesting significance of this character is that, superficially at least, it appears to represent a tropical habit of growth that has adapted itself to winter conditions, and may be inferred to represent a modified ancestral character that is a relic of some time in the past when the genus probably flourished under tropical or semi-tropical conditions. Incidentally also, this inference is strengthened by reason of the fact that the tree is able to live in localities where the winter temperature frequently kills the flower buds. In other words the weakest feature of the tree, under cold climatic conditions, is the apparently tropical habit of its inflorescence. The fact that the flowers do not bloom until relatively late in the season, in the latter part of April and early in May, when warm or mild weather is practically assured, would also seem to favor the idea of a warm-climate ancestry.

Another interesting and significant fact is that *Paulownia*, formerly regarded as belonging to the Scrophulariaceae or Figwort family, is now accredited to the Bignoniaceae or Trumpet-creeper family with its 500 or more species that are almost all restricted in their distribution to tropical regions. The only species of the family that occur in our region, other than *Paulownia*, are the Trumpet Vine (*Bignonia radicans*), and the Smoking Bean or *Catalpa* tree; but it is doubtful if either of these is indigenous as far north as the latitude of New York.

Very little is known about the origin or geologic history of *Paulownia*. Only one fossil species, *P. Europaea*, based entirely upon imperfect remains of leaves, is recorded in paleobotanical literature. This species was found in France, in deposits of late Tertiary (Pliocene) age; but as to its previous ancestry, or the former extent of the geographic distribution of the genus, there are, as yet, no available paleontologic records. In Europe it was evidently exterminated by the ice and cold of the Glacial epoch, but it maintained its existence in Eastern Asia, where it is an element in the native flora of that region.

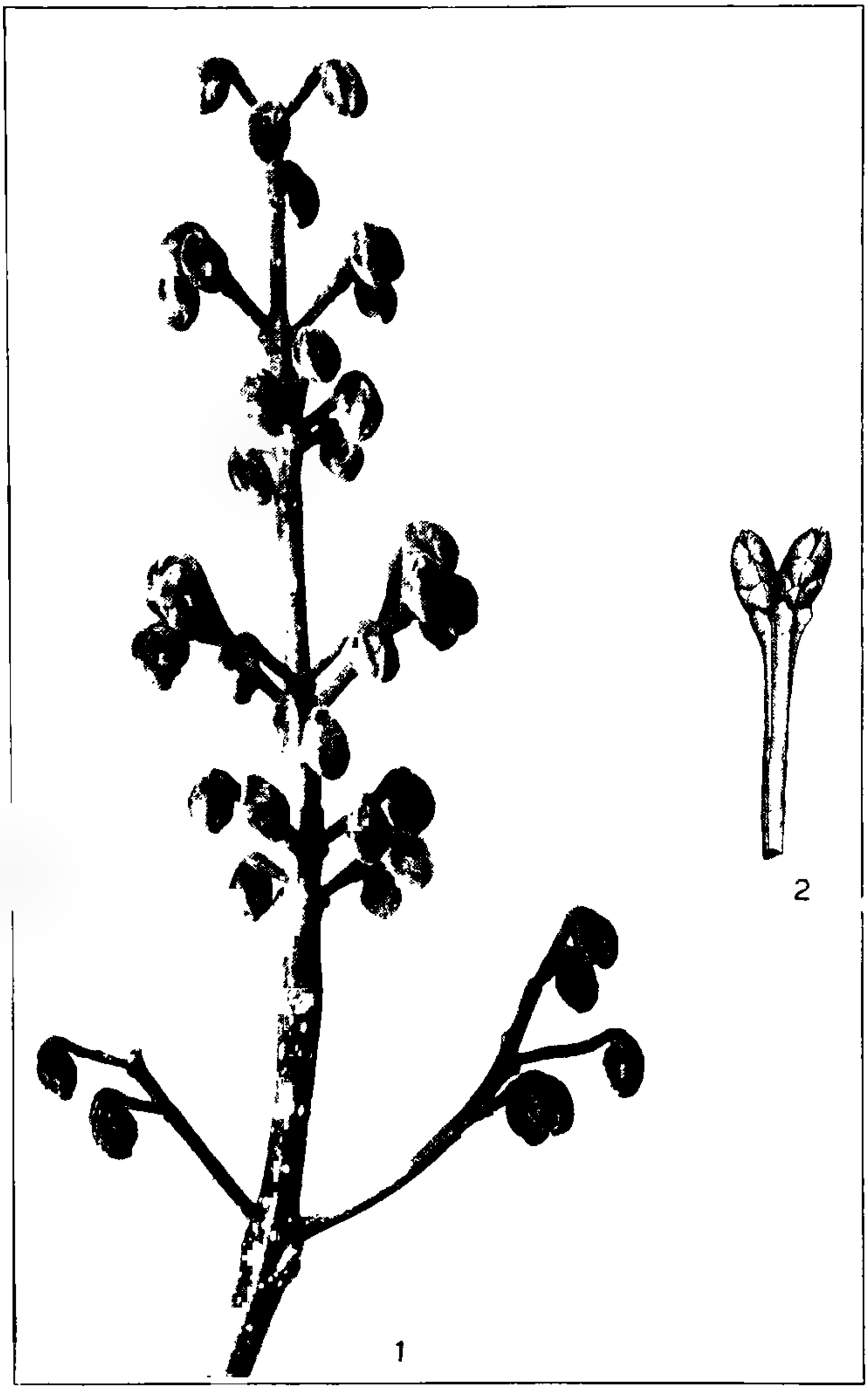

Fig. 1. Expanded winter-bed panicle of *Paulownia*.
Fig. 2 Contracted winter-bud panicles of lilac.
Both are slightly and proportionaly reduced in size. The specimens from which the figures were made were gathered Jan. 24, 1922.

Elsewhere throughout the world it is represented only by trees that have been introduced and by some that have escaped from cultivation.

ARTHUR HOLLICK

CHRYSANTHEMUMS FOR EVERYBODY

At this season of the year when leaves are falling everywhere, when the tender flowers have succumbed to the early frost, when all vegetation heralds the approach of winter and the general aspect of things is suggestive of the dying year, comes the Chrysanthemum. It bursts forth in all its lavish beauty, coming as a glorious climax to wind up the floral year.[1]

It is an old and well known flower, but the Chrysanthemum of the past made its chief appeal to those who had greenhouses to give it the necessary shelter to bring the flowers to perfection.

In recent years great changes have been wrought and new types and varieties have been developed so that to-day we have real hardy Chrysanthemums which anybody who wishes to, in town or country, can grow in the garden. This is not a mere figure of speech, for as I rode up on an elevated train I saw glorious white, yellow, pink and crimson Chrysanthemums which had been planted in boxes in a small backyard in the heart of the city, truly a charming little floral oasis in a desert of dirt and disorder.

You can have a perfect riot of Chrysanthemums if you wish it, for a period of from six to eight weeks. Given the heart's desire, the rest is comparatively easy. The cost, too, is little. for young plants can be purchased at planting time in May, for about twenty cents each.

CULTURE—Let us start in imagination with such plants as you can procure from any reputable dealer. The month of May is a good time to plant them out. They will grow in any ordinary garden soil, but if the soil is poor, enrich it by adding some bone meal or pulverized sheep manure, which can be obtained from seedsmen in handy, small packages. About

[1] Abstract of lecture by Mr. Arthur Herrington, November 6, 1921, at the N. Y. Botanical Garden.

two weeks after planting, when the young plants have become established and started to grow, pinch or cut off the growing tip. This pinching tends to make the plants bushy, well branched and comparatively self-supporting. A second pinching may be given if the plants seem to be growing too tall, but do not pinch later than the last week in June.

FEEDING—If the plants indicate the need of a little stimulant by reason of poverty of soil they can be given liquid food. A tablespoonful of nitrate of soda dissolved in two gallons of water will work wonders, but do not apply it more than twice during the season. Sheep manure, too, may be spread on the ground and watered in.

PESTS & DISEASES—The one persistent but not serious pest, if taken in time, is Aphis or Green Fly. It invariably appears during the growing season. It must be killed by a contact poison and the best remedy is a Nicotine preparation such as "Black Leaf 40," applied as directed on the container, in a fine mist-spray which thoroughly wets the shoots and the insects on them. If you have no facilities for spraying then smother the shoots with tobacco dust. Mildew sometimes appears and is indicated by white patches on the leaves caused, usually, by lack of sufficient water. Under opposite conditions, such as a season of heavy rains and hot humid weather, leaf-spot, which causes the leaves to turn black and fall off, may become prevalent. Both of these can be checked and controlled by using Sulphide of Potassium or "Liver of Sulfur" dissolved, one ounce in two gallons of water and sprayed on the foliage. It can be obtained from any good chemist.

VARIETIES TO GROW—There are now in cultivation so many varieties of good outdoor Chrysanthemums that a dealer's list is bewildering to the beginner, so the following selection is given as a help.

Early flowering kinds which commence to bloom in September.

White.....Smith's Advance
Yellow.....Cranfordia
Pink.... ....Charles Jolly
Bronze .....A. Barham

Pompons, Large-flowered

Pink.....Lilian Doty

White.....White Doty
Yellow .... .Connie Dick
Bronze .....Anna Moran

Pompons, small-flowered

Light pink...Little Gem
Deep pink...Rose Trevenna
Yellow.....Zenobia and the Baby
Bronze.....Mrs Frank Wilcox

Single-flowered Varieties

Pink.....Mrs. Buckingham & Kitty Riches
Very early
White.....Mensa
Yellow.....Golden Mensa
Bronze .....Glorianna and Ida Schiff

CONFERENCE NOTES FOR JANUARY.

At the conference of the scientific staff and registered students of the Garden on January 4th, reports were given by Dr. M. A. Howe and Professor R. A. Harper of the meetings of the A. A. A. S. at Toronto. Dr. N. L. Britton then displayed specimens of a "witches broom" from a plant of *Opuntia Dillenii* recently sent from Bermuda by Professor H. H. Whetzel. The "broom" consists of slender elongated branches very different from the normal branches of the plant. The particular interest in this material is that the marvel for Bermuda of the Floridian *Opuntia Pes-Corvi*, collected by the Challenger Expedition, may have been based on similar specimens.

A. B. STOUT

Secretary of the Conference

NOTES, NEWS AND COMMENT

At the meetings of the American Association for the Advancement of Science, the Botanical Society of America, and affiliated organizations, held in Toronto, December 27–30, 1921, the Garden was represented by Prof. R. A. Harper, Chairman of

the Scientific Directors, and Dr. Marshall A. Howe, Curator. In the joint session symposium on "The Utility of the Species Concept," Professor Harper discussed the subject "from the point of view of a morphologist." In the General Section of the Botanical Society of America, he presented a paper on "The Evolution of the Hymenium and the Classification of the Uredineae." In the absence of Dr. Millspaugh, Dr. Howe acted as chairman of the Systematic Section of the Botanical Society of America and also read a paper under the title of "Remarks on Fossil Coralline Algae from Trinidad, B. W. I." Following the annual "Dinner for all Botanists," held at the King Edward Hotel, Dr. Howe, in the unavoidable absence of Dr. N. L. Britton, the retiring President of the Botanical Society of America, presented "A Communication from the Retiring President." Dr. Britton's communication consisted essentially of his best wishes and his personal check for one thousand dollars "to be applied to any part of the work of the Society" deemed most necessary or desirable. Dr. and Mrs. Britton were unanimously elected Patrons of the Botanical Society of America. The total registered attendance at the Toronto meetings was somewhat more than eighteen hundred, of whom two hundred or more were botanists.

From the Office of Blister Rust Control of the Bureau of Plant Industry of the United States Department of Agriculture, the Garden has received a splendid exhibit of the white pine blister rust and illustrations of the methods employed for its control. The exhibit consists of four large hand colored photographs, specimens of the diseased plants and suitable, artistically printed labels. The white pine blister is one of our most dangerous introduced parasites and the Government is doing all in its power to warn the public of its danger and to show how to detect it and the best means to be employed for its control. The exhibit is installed in corner case (18) on the second floor of the museum building..

A letter recently received from Dr. A. Pulle, professor of systematic botany in the University of Utrecht, Holland, tells us that the University has come into possession of a second

botanical garden, presented by the heirs of the late August Janssen, who founded this garden in 1905 near his country residence about 15 kilometers from Utrecht. It is to be called "Cantons park" and already contains many important specimens of plants. Professor Pulle is director of the new garden, and we have sent him a complete set of *Bulletin of the New York Botanical Garden* as a contribution to the library, in exchange. Professor Went remains director of the older garden of the University.

Dr. N. L. Britton accompanied by Mrs. Britton and Miss M. S. Brown, left New York January 21st for Porto Rico, to be absent about ten weeks. They will make their headquarters at Coamo Springs and continue the botanical exploration of the island.

700 biology students from Morris High School visited the Garden on January 18, filling every seat in the large auditorium where public lectures are given. Mr. Inman addressed the pupils at 9:30 on the subject of "Forestry," using handsome lantern slides; and the various classes were shown through the conservatories by their own teachers and members of the Garden Staff.

About 20 young ladies from the Froebel League Training School, of Riverdale, made a special visit to the Garden on the afternoon of January 25, to study the classification of plants, and the methods of mounting, preserving, drawing, and investigating plant collections. They were guided through the various departments of the museum building by Miss Potter and a member of the Garden Staff.

Meteorology for January: The total precipitation for the month was 1.75 inches, of which 0.70 inches (seven inches by snow measurement) fell as snow. The maximum temperatures recorded for each week were as follows: *50° on the 5th*, 49° on the 9th, 45° on the 19th and 39° on the 29th. The minimum temperatures were: 7° on the 3rd, 16° on the 13th, 13° on the 23rd and *5° on the 26th*.

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Vol. 21, part 1, 1916; part 2, 1917; part 3, 1918. Chenopodiaceae—Allioniaceae.

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Vol. 24, part 1, 1919; part 2, 1920. Fabaceae (pars.)

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Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 32, part 1, 1918. Rubiaceae (pars).

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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIII February, 1922 No. 266

JOURNAL

OF

The New York Botanical Garden

EDITOR

R. S. WILLIAMS

Administrative Assistant

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN
AT 8 WEST KING STREET, LANCASTER, PA
INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

VOL. XXIII February, 1922 No. 266

THE WITCH HAZELS

Our native witch hazel, botanically known as *Hamamelis virginiana*, has long been known and admired for its interesting habit of blooming in late autumn, opening its yellow flowers in October and continuing in bloom until about Thanksgiving. These flowers are produced from winter buds, which in most plants lie dormant until spring. As well as being the latest plant to bloom during the year, witch hazel may actually be considered the earliest, appearing four months before its closest rival, the skunk cabbage, and five months ahead of the hepatica.

At the same autumn season the fruits, developed from flowers of the preceding year, ripen and are equally interesting owing to the explosive dispersal of the seeds. Unopened fruits, brought into a warm dry room, soon discharge the smooth black seeds and propel them as far as 40 feet. The best way to observe this action is to place the fruits on a saucer of dry sand, aiming them at an elevation of about 45 degrees, and setting the saucer near a radiator in a corner of the room.

There are four other species of witch hazel known, and three of them can be observed in the shrub collection of the New York Botanical Garden. Unlike the native species, these three bloom in the early spring and were in full bloom February 13, 1921. The Japanese witch hazel, *Hamamelis japonica*, has lemon yellow petals. The Chinese species, *Hamamelis mollis*, has deep yellow petals, suffused with red at the base, especially on the outer surface, and its flowers are delightfully fragrant. The Ozark witch hazel, *Hamamelis vernalis*, has petals of a dark

orange-red (Pompeian red of Ridgway), or yellow towards their tips, and its flowers are much smaller than any of the others. The four species are wonderfully alike in their foliage, fruit, and the structure of their flowers. The fifth species, *Hamamelis incarnata*, is also Asiatic, blooms in the spring, and has red flowers.

The five together illustrate some important features in the development of plant life in the north temperate zone, extending back more than a million years into the Tertiary period. Fossil evidence indicates that there were witch hazels then as now, and among them were undoubtedly the direct ancestors of our five modern species. How many species may have developed during that time can only be conjectured, but the great similarity of the existing ones makes it seem entirely possible that they had a single common ancestor during this preglacial time.

Through the long Tertiary period, when a mild climate extended north to latitude 80 and land bridges connected America with the Old World, our ancestral witch hazels migrated freely through the northern hemisphere, and were probably found throughout Europe, Asia, and America. Then came the glacial period with its several advances and retreats of the ice. The genial Tertiary climate of Alaska, Greenland, and Kamschatka became arctic, migration between Asia and America via Bering Strait ceased, and the Asiatic and American witch hazels were henceforth separated. Those of the western halves of the two continents were exterminated, and witch hazel was left only in eastern America and eastern Asia. The same fate befell hundreds of other species of plants at the same time, so that even today California and Europe contain a poor representation of the old Tertiary flora. The eastern states preserve a larger number, but the greatest number of these old types persist in the rich flora of eastern Asia.

Separated into two races, the descendants of our ancestral witch hazel have had thousands of years for further evolution, and they have used it. The actual details and method of their evolution is of course unknown. It may have involved mutation, orthogenesis, or hybridization, but in any case it was certainly favored by natural selection and by geographic isolation.

Two of the Asiatic species are still rather similar; but differ from the third; the two American ones are quite different. The Ozark species, preserving its spring-flowering habit, must be the

older species, and it is strange that it should be now restricted to the Ozark mountains, while our eastern witch hazel is generally distributed from the Missouri Valley to the Atlantic. There are other old species which have similarly found a sanctuary in the Ozark region, as well as many newer ones, which seem to have developed there in postglacial times.

Their habits of blooming in late fall or early spring is remarkable. It is not probable that plants bloomed at such unseasonable times in the long summers of the tertiary period. Now several of our trees have the habit, and our willows, elms, and silver maples open their flowers in March. Even herbaceous plants, like the hepatica, bloodroot, skunk cabbage, and anemone, bloom before spring has really opened, and some of them complete their year's growth and disappear by the middle of summer. Why do plants behave in this way? When and why did they acquire the habit?

It is fair to presume that it is in some way a result of the glacial period and of natural selection through that time. One theory has been advanced that a short summer compelled plants to start their activities at the earliest possible date in the spring. Another theory holds that these woodland plants could get sufficient light for their proper growth and development only in the early spring, before the forest trees above them had unfolded their leaves. Neither theory has been proved or supported by convincing evidence; readers may adopt either or reject both. Certain it is, though, that four of the witch hazels use the first warm days of late winter or earliest spring for flowering, and our native one even goes so far as to bloom the preceding autumn. No Japanese witch hazel can get ahead of a loyal American plant!

H. A. GLEASON.

WILD PUMPKINS

HAVE WE FOUND THE ORIGINAL HOME OF THIS GARDEN ESCULENT?

Notwithstanding the vast amount of literature that has been published on the early history of the world's cultivated plants, the origin of most of our staple vegetables and fruits is shrouded in mystery.

The homely pumpkin is no exception to this rule. Its origin must still remain a problem, perhaps, even though it should be shown that, like modern man, pumpkins also had ancestors who lived in trees.

Referring to the history of the pumpkin it has been said:[1] "If we consider the stability of types, and the record of variations that appear in cultivated plants, and the additional fact that so far as determined the originals of cultivated types have their prototype in nature, and are not the products of culture, it seems reasonable to suppose that the record of the appearance of types will throw light upon the country of their origin. From this standpoint, we may hence conclude that, as the present types [pumpkins] have all been recorded in the Old World since the fifteenth century, and were not recorded before the fourteenth and succeeding centuries, there must be a connection between the fact of the discovery of America, and the fact of the appearance of pumpkins and squashes in Europe."

Reporting on a collecting excursion to Lake Okeechobee in 1913, the writer said[1] "Various vines struggle to the tops of the trees for sunlight, the more conspicuous are, a kind of gourd, and still more surprising a high-climbing dewflower (*Commelina*)."

The kind of "gourd" was found in the hammocks of the four islands of Lake Okeechobee and in the hammocks of the southern and eastern shores. An examination of a collection made on the southern shore of the lake a year previous brought the same plant to our attention. Repeated superficial studies of the specimens brought out little definite information and they were put away for future consideration. On a subsequent excursion to Lake Okeechobee in May, 1917[1], we again found this "gourd" in the dense hammocks of the southern shore of Lake Okeechobee, and also in those of the southwestern shore.

In the meantime, there had come to our attention a certain old Spanich record of exploration in Florida—a "memoir" of Hernando de Escalante Fontaneda—written in Spain about the year 1575, and therein it is written "We still speak of the country towards Abalachi, which is in the direction of Pa'nuco,

[1] E. L. Sturtevant, The History of Garden Vegetables in American Naturalist, 24: 739. 1890.

[1] Journal of the New York Botanical Garden **15**: 72–73. 1914.

[1] The American Museum Journal, **28**: 684–700. 1918.

where resounds the fame of its abundance of pearls; and it is certain that they do exist. Between Havalachi and Olagale is a river the Indians call Guasacaesgui, which means in our language, Rio de Canas (river of canes). On this river, arm of the sea, and coast, are the pearls, which are got in certain oysters and Conchs. They are carried to all the provinces and villages of Florida, but principally to Tocobaja, the nearest town; because in it resides the King, who is chief cacique of the region lying on the right-hand side coming to Havana. He is called Toco-ajachile, has many vassals, and is an independent king." Now in a note the translator says: "The town Tocobaja was at the entrance of a river, twenty leagues from the coast, on an arm of the sea.* The ships of the admiral were piloted up to it in the night time by an Indian of Calos. This bay should be what is now called Charlotte Harbor."

"The word *to-co-ba a chile* are Chanata, and signify, in their succession, "gourd place bringing forth" or "Country-where gourds-are-produced."

When we came to study our specimens seriously it was found that the foliage and flowers of our "gourd" could not be distinguished from those of the cultivated pumpkin! At first sight, however, the fruits did not suggest those of that common garden plant. Yet, upon close examination they did appear to be diminutive pumpkins, even the seeds being the same as those of the pumpkin we cultivate.

The fruits are spheroidal, varying in size from that of a standard base-ball to that of a croquet ball. They are pale yellow and sometimes variegated with green markings.

The interpretation of the geography of the early Spanish adventures is usually somewhat uncertain. But, without doubt, the pumpkin we discovered near Lake Okeechobee about the beginning of the twentieth century is the same as the "gourd" referred to in the memoirs of Hernando de Escalante Fontaneda way back in the sixteenth century or within a century after Christopher Columbus discovered the New World.

There seems to be no good reason, therefore, for doubting that we really have discovered the pumpkin's Garden of Eden. This

* A stream, "Flumen Pacis," is represented on the map of Le Moyne that well answers for this river, which possibly may have been so called at that time. Have we in the name the original of "Peas creek"?

is so especially in view of the fact that the geographic range, as far as we know it, of this ancestral pumpkin is rather restricted. *i. e.* the Lake Okeechobee region, including doubtless, the unexplored hammocks of Lake Istokpoga. However, the range may have been more extended several centuries ago when Florida possessed a warmer and more evenly tempered climate. As late as the middle of the eighteenth century, Bartram[1] records the occurrence of the royal-palm (*Roystonia regia*) nearly as far north as the Lake George region and his account of a combat between alligators as he termed them, may really refer to crocodiles, as his description of the methods of combat describes those of crocodiles and not those of the hardier alligators. Now the crocodiles have all but disappeared even from southern Florida.

The pioneer white men found the Seminole Indians of the peninsula cultivating a kind of pumpkin. This was popularly named the Seminole-pumpkin. In modern Seminole speech, which is a Moskogee variant and in no way related to the aboriginal tongue, pumpkin is *Chos-chee*. The stem and flowers are identical with those of our various cultivated pumpkins. The fruits are larger than in the wild plant described above and they vary from spheroidal, often much depressed, through pyriform to those with a short stout neck.

It is possible that the pumpkins found by the early travellers and pioneer settlers in more temperate North America as a staple cultivated crop among the American Indians, were descended from our wild Okeechobee pumpkin, through the Seminole pumpkin as its more or less similar ancestor.

The Seminoles, as far as we can learn, inherited this esculent from the Florida aborigines, who may have developed it through many generations or ages from the wild plants now forced to the wall, so to speak, in the hammocks of Lake Okeechobee, and perhaps those of Lake Istokpoga, for there are no other localities on the Florida mainland that are immune from the frosts accompanying "freezes." The pumpkin plants grow either in the almost pure humus of the primeval hammocks as described and illustrated in a former paper[2] or on the sandy shores of Lake Okeechobee. Several attempts to grow vines

[1] Travels through North and South Carolina, Georgia, East and West Florida. 1792.

[2] The American Museum Journal **18**:648–700. 1918.

to maturity at the New York Botanical Garden were unsuccessful. However, we are growing specimens in the reservations of Charles Deering in southern Florida where this plant can readily be compared with that of the Seminole pumpkin.

The present-day Seminole Indians are acquainted with the wild pumpkin, but the only information that can be gathered from them in regard to its past history, is that it got there just like the shrubs and trees and has always been there. "Always" of course, in this case means as far back as the individual Indian remembers.

JOHN K. SMALL.

THE COLLINS COLLECTION OF ALGAE

The Collins collection of seaweeds and their freshwater relatives was acquired for the herbarium of the New York Botanical Garden early in the present year through the personal generosity of Director-in-Chief Britton. The collection includes about 41,300 specimens and was doubtless one of the largest privately owned special herbaria of its sort in existence. Besides the strong representation of New England and Bermuda algae, the collection contains many specimens of scientific value from the Philippines (Shaw, Merrill), South Africa (Becker, Tyson), Australia (Hussey), Japan (Yendo), India (Merrifield), Dutch East Indies (Weber van Bosse), South Seas (Reinbold), France (Chalon), California and Alaska (Setchell, Saunders, Gardner), and Venezuela (Blakeslee). Two sets of special exsiccatae were included: Tyson's South African Marine Algae, a series of 100 beautiful specimens, and Hauck & Richter's Phykotheca Universalis, including 750 specimens. Of the latter, the Garden previously possessed an incomplete set. Other sets of exsiccatae, already represented in the Garden herbarium, were not included in the purchase.

Mr. Frank S. Collins, of Malden and later of North Eastham, Massachusetts, who brought together this large collection of algae, was a business man, an expert accountant, who devoted his fragments of leisure time to the advancement of scientific knowledge. In early manhood he developed an interest in botany and he was associated with the late Lorin L. Dame in

the preparation and publication of the "Flora of Middlesex County, Massachusetts." His interest soon centered chiefly in the algae and he became one of the best-known and most effective of the American writers on this group of plants. His two most important works are "The Green Algae of North America," published in 1909, with supplements in 1912 and 1918, and, with Dr. A. B. Hervey, "The Algae of Bermuda," published in 1917. At the time of his death, which occurred on May 25, 1920, he had nearly ready for publication manuscripts on the algae of the Philippine Islands, on the algae of a Canadian-Arctic Expedition, and on the marine algae of the northeastern coast of North America. These three manuscripts have been turned over to the present writer to be edited and completed for publication. In association with Professor W. A. Setchell and the late Isaac Holden, Mr. Collins issued the Phycotheca Boreali-Americana, a collection of dried specimens of the algae of North America, which had reached a total of 2,400 numbers, a total only slightly exceeded by Rabenhorst's "Die Algen Europa's," the only other series of algae exiccatae that ever approached the Phycotheca in magnitude.

Mr. Collins was one of the original members of the New England Botanical Club, was for three years its president, and was for more than twenty one years an associate editor of its journal, *Rhodora*. In recognition of his contributions to botanical literature, Tufts College, in 1910, conferred upon him the honorary degree of Master of Arts.

The Collins collection of algae is the latest of a notable series of large collections which have been purchased to facilitate the systematic researches that are carried on at the Botanical Garden. Prominent among these are the J. B. Ellis collection of fungi, numbering about 80,00 specimens; the Mitten collection of mosses and hepatics, including about 50,000 specimens; the Otto Kuntze herbarium of more than 30,000 miscellaneous specimens, presented to the Garden by the late Andrew Carnegie; the Vigener herbarium of more than 20,000 specimens, also presented by Mr. Carnegie; the Underwood fern collection, with 16,000 specimens; the A. Henry collection of Chinese plants, including nearly 8,000 specimens; and the Jenman collection of West Indian and South American ferns, comprising about 4,000 specimens and given by the late D. O. Mills, the first president of the Board of Managers of the Garden.

MARSHALL A. HOWE.

PUBLICATIONS OF THE STAFF, SCHOLARS AND STUDENTS OF THE NEW YORK BOTANICAL GARDEN DURING THE YEAR 1921

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GREENHOUSE LECTURES, MARCH AND APRIL, 1922

The regular public lectures in the Central Display Greenhouse, Conservatory Range 2, will be given this spring at 3:15 o'clock on Saturday afternoons. Living plants will be used in illustration.

March 18. "Some Interesting Plants Now in Flower," Mr. K. R. Boynton.

March 25. "The Relation and Reaction of Plants to Light," Dr. H. A. Gleason.

April 1. "How Seeds Change to Seedlings," Dr. A. B. Stout.
April 8. "Tropical Ferns," Dr. M. A. Howe.

Conservatory Range 2 is situated at the eastern side of the Botanical Garden, north of the Allerton Avenue entrance. It is most conveniently reached from the Allerton Avenue Station on the White Plains Extension of the Subway from East 180th Street. Visitors coming by train to Botanical Garden Station should inquire at the Museum Building.

W. A. MURRILL.

CONFERENCE NOTES

The February conference of the scientiflc staff and registered students of the Garden was held on the afternoon of the 1st.

"A new genus of Rapateaceae" was discussed by Dr. H. A. Gleason and Dr. J. K. Small reported on "Recent Exploration in Florida." Both of these papers will appear in print in the near future. Dr. A. B. Stout reported on the appearance of a new form of flower type in *Lythrum Salicaria* in which one set of stamens and the pistil are of equal length and also of the appearance of an apetalous variety. These new types have developed in pedigreed cultures as extreme variations.

A. B. STOUT,
Secretary of the Conference.

NOTES, NEWS AND COMMENT

An inspection for members of the Garden was held on the afternoon of February 16, at Conservatory Range 1, several members of the Garden staff being on hand to show visiting guests through the fifteen different houses constituting the range. The cactus collection was first inspected, and the houses were taken in order, ending with the aquatic house. The day was fine, in spite of the snow, and everyone expressed satisfaction with the excellent appearance and condition of the plants.

Two troops of Girl Scouts spent the day at the Garden on February 22, and were shown through the buildings and grounds by a member of the Garden staff. One troop was from Rochelle, New Jersey, the members of which were guests of Troop 11 of the Bronx.

Meterorology for February: The total precipitation for the month was 2.41 inches, of which 0.80 inches (8 inches by snow measurement) fell as snow. The maximum temperatures recorded for each week were as follows: 53° on the 2nd, 42° on the 6th, 47° on the 19th and *62° on the 20th.* The minimum temperatures were: 21½° on the 1st, 12° on the 8th, —*2° on the 17th* and 19° on the 25th.

ACCESSIONS

1 plant of *Clerodendraon fragrans.* (Given by Miss Mary Bell.)
12 plants for Conservatories, (Given by Miss Knowles.)
1 plant of *Cereus* for Conservatories. (Given by Mr. J. W. Markwell.)
1 plant of *Allamanda Hendersonii.* (Given by E. C. Benedict Estate.)
18 plants of Cacti for Conservatories. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)
55 cuttings of *Populus.* (By exchange with U. S. Dept. Agric.)
4 plants for Conservatories. (By exchange with Mr. W. A. Manda.)
2 plants for Conservatories. (By exchange with Miss A. Delamar.)
3 plants of *Begonia Rex.* (By exchange with Mr. Samuel Untermyer.)
11 plants for Conservatories. (By exchange with Mr. Wm. B. Thompson.)
1 pkt. of Dodecatheon Media Seed. (Given by Mrs. Francis C. Farwell.)
2 pkts. of Water Lily Seed. (By exchange with Missouri Bot. Garden,
18,700 tulip bulbs. (Given by Holland Bulb Growers Association.)
900 Narcissus bulbs. (Given by Messrs. Eddy and DeUreede.)
7 plants of *Hymenocallis.* (By exchange with Mr. T. L. Beatty.)
25 plants of *Iris cristata* for Nurseries. (By exchange with Dr. W. C. Coker.)
33 plants of *Iris* for Nurseries. (By exchange with Dr. W. C. Coker.)
26 plants for Conservatories, all Cacti. (By exchange with U. S. National Museum through Dr. J. N. Rose.)
59 plants derived from Seed.
5 pkts. of seed. (By exchange with B. G., Batum, Russia.)
4 pkts. of seed. (Given by Mr. W. T. Goethe.)
1 pkt. of Seed. (By exchange with Prof. H. H. Whetzel.)
1 pkt. of Seed. (Given by Mr. K. K. MacKenzie.)
1 pkt. of Seed. (By exchange with Mr. H. Buckley.)

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5. A copy of the monthly Journal.
6. Privileges of the Board Room.

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Annual members may become Life Members by the payment of a fee of $250.00.

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Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

Form of Bequest

I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....

Vol. XXIII March, 1922 No. 267

JOURNAL

OF

The New York Botanical Garden

EDITOR

R. S. WILLIAMS

Administrative Assistant

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN
AT 8 WEST KING STREET, LANCASTER, PA
INTELLIGENCER PRINTING COMPANY

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On Elliott's Key.—A patriarch—the sole remaining bucaneer-palm of a former generation. Several young specimens as yet with undeveloped stems occur in the jungle. Twenty-five years ago a number of specimens, similar to the one shown on this plate were moved from Elliott's Key to Miami. Ten were planted on a line dividing two properties. Only two of these are now alive. A few specimens, first and second generations of progeny of the old palms, are growing at Miami.

JOURNAL
OF
The New York Botanical Garden

VOL. XXIII March, 1922 No. 267

THE BUCANEER-PALM

HISTORY AND DISTRIBUTION OF PSEUDOPHOENIX

With Plates 269 and 270

Florida is a region where endemic plants are not rare, many well-known groups being partly or wholly represented by isolated species not known to occur in any other geographic area; moreover, there are endemic genera. Not many years ago the palm family in that State was credited with an endemic monotypic genus.

In 1886 interest was aroused among botanists when a palm, constituting a new genus, found in the hammocks of Elliott's Key, was described for the first time.

The forest of Elliott's Key was the scource of the first specimens of several typically West Indian shrubs and trees found this side of the Gulf Stream. *Pseudophoenix Sargentii*, or in common parlance the hog-cabbage palm, was one of this category, and for a long time it was considered to be confined to two islands of the Florida Reef.

The name *Pseudophoenix*—false-phoenix — refers to the resemblance of its habit to that of certain species of the genus *Phoenix*, to which the historic date-palm belongs. The specific name mentioned above in is honor of Charles Sprague Sargent* the discoverer of the plant on Elliott's Key.

* Charles Sprague Sargent was born at Boston, Massachusetts, April 24, 1841. Shortly after his graduation at Harvard, he entered the army and served as an officer for the last two years of the Civil War, leaving the service

The common name—hog-cabbage palm—is in reference to the use made of the pithy trunk and bud, in some places, for feeding swine. The bud, used also for human food, is prepared by boiling, as is that of the cabbage-tree (*Sabal Palmetto*)—this latter called by the natives "swamp-cabbage"—and is in great favor as a vegetable in some parts of the southeastern United States.

The hog-cabbage palm, or "hog-palmetto," as it is also called, is not infrequently called royal-palm, but really has no close morphological relationship to the genus *Roystonea*. It has its closest relatives in the Indies of both hemispheres, in Central America, and in northern South America.

Renewed interest in it was aroused during the past two decades as a result of exploration carried on in the West Indies by the New York Botanical Garden. Recent studies, however, have indicated that the history of this palm really dates from the year 1686, rather than 1886, as the year when it was first found in Florida.

About midway between the discovery of America and the present time, or in other words near the beginning of the eighteenth century, Charles Plumier* was in Hispaniola—the island

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as brevet major of volunteers. For nearly fifty years he has been the director of the Arnold Arboretum of Harvard University, at Jamaica Plain, Massachusetts. His many sumptuous volumes devoted to woody plants, and the wonderful collection of trees and shrubs that has grown up under his guidance in the Arboretum of which he has so long been director, have brought him world-wide fame.—John Hendley Barnhart.

* Charles Plumier was born at Marseilles, France, April 20, 1646. At he age of 16 he entered the order of Minims, and while pursuing his studies at Rome became interested in botany, and was instructed in that science by Paolo Boccone. From Rome he went to Aix, and while there explored southern France botanically with much thoroughness, much of the time in company with Garidel, sometimes with the already famous Tournefort. In 1689 he was chosen by Joseph Donat Surian to accompany him as artist, during his botanical exploration of the French possessions in the West Indies, and made two voyages during the years 1689-91. Upon Surian's death in 1691, he followed him as "botanist to the king," and made a third voyage to the West Indies in 1696–97. He was starting upon a fourth voyage to America when, November 20, 1704, he died at Cadiz, Spain. Plumier prepared much manu-

at present called Haïti or Santo Domingo. He wrote extensively on the flora of tropical America, where he traveled, and much was published. However, among Plumier's unpublished manuscripts, Martius found a record of a palm discovered in Santo Domingo which Plumier referred to as "Palmae dactiliferae et viniferae."

Following is a translation from the Latin of Martius, derived from Plumier's manuscripts, and recorded by Martius, together with an introductory paragraph, in his *Historia Naturalis Palmarum*, volume three, page seventy-five, in a part published September 1, 1845:

"Another odd growth of the trunk is found in a certain palm of the Antilles, which Plumier has very well described by the name 'date and wine bearing Palm' and has illustrated in plates 29 and 30 of a book on Palms, which is preserved in the library of the Royal Gardens at Paris; we have had drawn figures, reproduced herewith in morphological plate Z II figures XVIII, XIX, called by us *Euterpe vinifera* until more shall be found out about it. But if I understand correctly the words of the author on this subject, the trunk of this palm does not attain the usual shape of a cylinder or of a spindle, but grows upwards into a club, the substance of the wood in this region being not compact and hard, but rather pithy and containing a very great abundance of sugary juice. Moreover, this club when it reaches a certain stage of maturity suddenly grows up from its top into a smooth and much narrower cylinder, by whose development the crown of leaves is suddenly lifted up. It is not clear whether this palm makes this cylinder by a single change, in which case you may easily imagine it to be monocarpic like *Metroxylon*, or by a double change, which is most likely, so that it develops the cylinder gradually and this gradually enlarges into the form of a club.

"On account of its novelty we here transcribe all that Plumier says about it.

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script and many drawings relating to American plants. A part of his work was published during his lifetime, and more after his death, but much of it remains unpublished until this day. His manuscripts and many of his drawings are in French libraries, but there are five volumes of the latter in the Banksian library at the natural history museum in London. He left no herbarium of his own, but many of his plants are in the herbaria of Surian and Tournefort, both of which are preserved at the natural history museum in Paris. His West Indian studies were chiefly in Haiti and Martinique, but he also visited St. Vincent, Guadeloupe, St. Kitts, and St. Thomas.—John Hendley Barnhart.

"In the dry and rougher forests of the island of Santo Domingo, this stately palm occurs in abundance; they call it commonly 'wine palmetto,' on account of the liquor which our hunters (known as 'bucaneeri'*), extracting from the pith of the trunk, drink with the greatest delight. The palm then, whose base or the lower part of whose trunk is swollen like the form of some pedestal, roots by innumerable roots nearly an inch thick, black and extremely tough. The more slender trunk, arising from the base, then gradually swelling up to the top like some garden herb, yet eventually it is drawn out into a very long and graceful neck. Many leaves occupy the end of this neck, conspicuous, and extending in a ring as in other palms, and furnished with segments like reed-leaves arranged along the stipes like the teeth of a comb. Among the leaves spathes break out as in other palms, producing the spadix, branched and full of flowers containing an embryo (*i. e.* a pistil); which embryos at length develop into globular fruits a little larger than our cherries, suffused with the lustre and red color of coral, covering with thin pulp the very hard and rounded little stone. These fruits constitute a very graceful cluster about four feet long, hanging from within the cluster of leaves. About August they ripen and fall, when they supply very welcome food to the wild hogs and horses. Moreover, the method of making wine from the pith of this palm is this. A palm of middle age, that is to say, one which has not yet developed a neck and has not yet produced fruit, is selected and cut down with an axe; at

* In this connection the following paragraphs from the Century Dictionary and Cyclopedia 1: 703 are interesting as showing the history and the evolution of the word bucaneer:

Bucaneer—"Originally, one of the French settlers in Hispaniola or Hayti and Tortugas, whose occupation was to hunt wild cattle and hogs, and cure their flesh.

"It is now high time to speak of the French nation who inhabit a great part of this island (Hispaniola). The Hunters are again divided into several sorts. For some of these are only given to hunt wild Bulls and Cows, others only hunt wild Bores. The first of these two sorts of Hunters are called *Bucaniers* . . . When the *Bucaniers* go into the woods to hunt for wild bulls and cows, they commonly remain there for the space of a whole twelve-month or two years without returning home."—*Bucaniers of America* (London 1684) page 59.

"A pirate; a freebooter; especially one of the piratical adventurers, chiefly French and British, who combined to make depredations on the Spaniards in America in the second half of the seventeenth century; so called because the first of the class were Frenchmen driven from their business of bucaning by the Spanish authorities of Hispaniola."

the swollen part of the prostrate trunk, that is near the region of the future neck, a segment of the bark or wood (for it has wood for bark) about a foot wide and two feet long is cut out. The pith which is contained in this part, soft, fat, and juicy and very sweet, is taken out, and pounded with a great wooden pestle in the hollow from which it was extracted, until the juice can be easily pressed out with the hands. When the pith has been thoroughly crushed they cut another square hole in the same trunk, for a future barrel as it were; placing on this leaves of the palm (lest dust should be mixed with the juice) and squeezing vigorously with the hands over these leaves the lumps of crushed pith they drop the juice into the hole, and leave it there for some time, until it has fermented sufficiently. Drawing out the fermented liquid in small vessels (which they call Joubellines) made of the leathery involucres (spathes) of this same palm, they drink it with delight. This beverage rivals the whey of milk, not only in its flavor, but also in its whiteness when it is first obtained; one has to beware of it lest more than proper be drunk, for as I myself have learned from many, if more than sufficient is taken, it produces drowsy effects."

The Santo Domingan palm described in the preceding paragraph has recently been associated with the Floridan *Pseudophoenix Sargentii* by Dr. N. L. Britton in "The Bahama Flora," 61, 1920, where it is referred to as *Pseudophoenix vinifera*.

The paragraph from Plumier's manuscript gives us the history of the palm in question down to about the end of the seventeenth century, although the matter was not published until about a century and a half after it was written. After Plumier's time there followed an interval of nearly two hundred years before it was again directly brought to notice in botanical literature. Of course, references to the palm may exist with which we are not acquainted.

The later history of this palm dates from its discovery on the Florida Keys in the spring of 1886. In the fall of that year attention was called to the discovery by C. S. Sargent,* in a short paper in which he merely referred to some of the technical characters of a supposedly new palm he had found and to the localities on Elliott's Key where he had found it.

Two years later, however, the circumstances connected with its discovery were recorded by A. H. Curtiss and C. S. Sargent in two papers from which we quote:

* Botanical Gazette **11**: 314. 1886.

"A botanical survey of that unique portion of our country known as the Florida Keys confirms an opinion that would naturally be formed after studying a map—namely, that the flora of these islands is nearly, if not quite, identical with that of the coast region of the neighboring Antilles. Among the very few species which botanists do not know to grow elsewhere—though it is probable that they may be found in more southern regions—is the newly discovered *Pseudophoenix Sargentii*. This interesting Palm is confined to two of the Keys, namely, Elliott's and Long, which are over fifty miles distant from each other. On account of the small number of these trees and the precarious conditions under which they grow, they might have disappeared wholly from the world but for their timely discovery by Professor Sargent and the enterprise of Messrs. Reasoner Brothers, of Manatee, in obtaining plants and seeds for cultivation."*

"On the 19th of April, 1886, in company with Mr. C. S. Faxon, Mr. A. H. Curtiss, and Lieut. Hubbard, of the United States Navy, I landed from the Light-house Tender 'Laurel' near the eastern end of Elliott's Key, one of the larger of the Florida Reef Keys, at the house and pineapple plantation of Mr. Henry Filer. Our attention was at once directed to a solitary plant of a small pinnate-leaved Palm, left standing in the clearing, which at first sight, was mistaken for an Oreodoxa, but the large orange-scarlet fruit at once showed that we had stumbled upon a tree unknown before in the North American Flora, and quite unlike any of the species of palms known to us. Specimens of the fruit, which was not, unfortunately fully ripe, were sent to Dr. Wendland, of Hanover, who provisionally pronounced our Palm to be the representative of a new genus, for which he proposed the name of Pseudophoenix. A short account of this discovery, with the announcement of Dr. Wendland's new genus, but without characters, was published in the issue of the Botanical Gazette, for November, 1886, but it was not until a year later that I received through Mr. Curtiss ripe seed of the Pseudophoenix, which was sent to Dr. Wendland, who has drawn up from it generic characters.†

"A few individuals were discovered scattered through the woods in the neighborhood of Mr. Filer's plantation, and, late in the same year, a grove of them was discovered near the east end of Long's Key by a gentleman from Bay Biscayne whose name I cannot recall. There are about 200 plants, large and small, in this grove, which is represented in the illustration upon page 353 from a photograph made by Mr. James N. M. Codman

* A. H. Curtiss, Garden and Forest 1: 279. 1888.

† Here is inserted a technical description.

at the time of our visit to Long's Key in the spring of 1887. These are the only stations where Pseudophoenix is now known, but as the flora of the Florida Reef Keys is Bahaman in its constitution, and probably in its origin, it would be a singular fact if this was not found in some of the Bahama group, the plants of which are still very imperfectly known."*

Six years after the above account was published the palm was described in the "Silva"† where, for some unexplained reason the second cited locality is given as Key Largo, instead of Long Key. These are different islands, and as far as we are aware, the palm has not yet been found on Key Largo. It was also figured in the "Silva" from specimens found on Elliott's Key. A chronological list of figures and plates is given in a foot-note.‡

Within three years after its discovery in Florida, John I. Northrop and Alice R. Northrop§ found *Pseudophoenix* on

* C. S. Sargent, Garden and Forest **1**: 352. 1888.

† Silva of North America **10**: 33–35. 1894.

‡ Garden and Forest 1: *fig. 55*, *fig. 56*. 1888; Silva of North America **10**: *pl. 506*, 1894; Journal of the New York Botanical Garden **5**: *fig. 21*. 1904, **6**: 17. 1905.

§ John Isaiah Northrop was born in New York City, October 12, 1861. After graduation as engineer of mines at Columbia College, in 1884, he spent a short time as an assayer at Deadwood, South Dakota, returning to Columbia in 1886 for graduate work, and receiving his Ph. D. degree in 1888. He devoted himself particularly to zoology, but was also interested in geology, mineralogy, and botany. He spent the first half of the year 1890 in scientific exploration of the Bahamas, most of the time on Andros, the largest and one of the least-known islands of the group. In 1891 he was appointed tutor in zoology at Columbia, and it was in connection with his work in that capacity that he met with the accident that resulted in his death, June 26, 1891, in his thirtieth year.

Alice Belle Rich was born in New York City, March 6, 1864. She graduated at the Normal College of that city (now Hunter College) in 1882, and was tutor in botany in that institution from 1885 to 1889. She married John I. Northrop, June 28, 1889, and was closely associated with all of his scientific work, including the Bahama exploration, during the two years of their married life. After his death she continued, as health permitted, the study of the plants collected in the Bahamas, and eleven years later published her "Flora of New Providence and Andros," as volume 12, part 1, of the Memoirs of the Torrey Botanical Club.—John Hendley Barnhart.

Andros, Bahamas, thus fulfilling the prophecies in the preceding quotations. This discovery, however, was not made known until twelve years later when O. F. Cook* made the specimens the type material of a supposed new genus and species, *Cyclospathe Northropi*.†

After the New York Botanical Garden took up the botanical exploration of the West Indies the geographic range of *Pseudophoenix* became evident. The sequence of the discoveries may be most interestingly referred to by quotations from the printed records of exploration:

Bahamas—Great Inagua—"Captain Mitchell had been referring to a palm which the natives called 'mountain-cabbage,' and on this trip to Balsam Hill we saw it for the first time. What was my surprise and delight on finding it to be *Pseudophoenix Sargentii* H. Wendl., still another palmoriginally known from Florida. It grows in considerable abundance scattered throughout the scrub, and fruits here when six or eight feet high."

"Our next stopping place was Camfield Bay, ... A single tall plant, about twenty feet in height, of *Pseudophoenix Sargentii* was also observed."‡

Bahamas –Whale Cay—"The exploration of Whale Cay occupied us on January 29; it has deeper and more abundant soil than many other Bahama islets, and contains the largest forests of Sargent's palm (*Pseudophoenix Sargentii*) that we know of, certainly composed of several thousand trees, many of which were in full fruit at the time of our visit; they grow densely intermingled with other trees, forming a most interesting coppice, part of which has already been cleared for a sisal farm, leaving the palms, at least temporarily, to shade the young fiber-plants."§

* Orator Fuller Cook was born at Clyde, New York, May 28, 1867. He graduated at Syracuse University in 1890, and was an instructor there the following year. For the next seven years, as special agent of the New York State Colonization Society, he made many visits to Liberia; since 1898, at first as agent and later as botanist for tropical agriculture and bionomist of the United States Department of Agriculture, he has repeatedly visited various parts of tropical America. Ever since 1898, also, he has been an assistant curator and custodian in the United States National Museum. His scientific interests are of unusual breadth, embracing myriapods and general biologic problems as well as studies on economic plants of tropical regions.—John Hendley Barnhart.

† Memoirs of the Torrey Botanical Club **12**: 25. 1902

‡ George V. Nash, Journal of the New York Botanical Garden **6**: 9, 10. 1905.

§ N. L. Britton, Journal of the New York Botanical Garden **6**: 80. 1905.

On Long Key.—A grove of young bucaneer-palms on the eastern fork of the island, as it appeared half a century ago. These palms have long since been removed and sold as royal-palms. All the larger specimens seem to have been taken away from the key, and nearly or quite all the young ones. The last ones observed, a number of specimens as yet without stems, were transplanted to Upper Matecumbe Key, where they were installed as royal-palms.

Bahamas—Little San Salvador—"The island is interesting from the great abundance of the hog cabbage palm (Pseudophoenix Sargentii), its common name referring to the use of its trunk for pig food; this palm, which formerly existed is quantities on some of the Florida Keys, but has now been nearly or quite exterminated there, exists on Little San Salvador in thousands, and was in full fruit at the time of our visit, the clustered bright-red three-lobed berries being conspicuous in the landscape. The palm occurs on nearly all the Bahama Islands, but in the inhabited ones is much needed for pig food, and is thus liable to extinction; . . . "*

Bahamas—Mariguana—"The hog-palm (*Pseudophoenix Sargentii*) appeared to be represented at the southeast end of Marguana by a single specimen, less than six feet high."†

Cuba—Cayo Guajaba—" . . also a small specimen of the hog cabbage-Palm, *Pseudophoenix Sargentii*. In this latter identification I was corroborated by a Bahaman negro who seemed familiar with this palm and its peculiar economic uses. He also stated that a dozen or more larger specimens existed toward the western end of the island."‡

Hispaniola—Saona—"The character of the vegetation here is much the same as that previously collected at Bayojibe, a notable exception being still another palm. This plant proved to be *Pseudophoenix Sargentii* and we found it in considerable quantities. It resembles the royal palm but is much smaller."§

The latter collection completes the cycle and takes us back to the region where this palm was discovered over two hundred years ago.

About the same time as these latter collections were made in Saona, moreover, additional discoveries were made in:

Cuba—Cayo Romano: "The groves were almost entirely composed of *Pseudophoenix Sargentii*, called by the fisherman "palma guaney." These palms occurred in all sizes from fresh seedlings to fruiting specimens, probably 35 feet tall."

"Numerous seedlings of *Pseudophoenix Sargentii* occur on the north slope of Alto Aji hill, but fruiting specimens were seen only on the southern slope where they were very abundant and of large size."¶

* N. L. Britton, Journal of the New York Botanical Garden **8**: 75. 1907.

† M. A. Howe, Journal of the New York Botanical Garden **9**: 46. 1908.

‡ J. A. Shafer, Journal of the New York Botanical Garden **10**: 136. 1909.

§ Norman Taylor, Journal of the New York Botanical Garden **11**: 14. 1910.

¶ J. A. Shafer, Journal of the New York Botanical Garden **11**: 150 and 155. 1910.

Cuba—Cayo Guajaba—"Groves of *Pseudophoenix Sargentii* composed of very tall, slender individuals occur near the shore as well as on the summit of the southernmost hills." *

From the preceding records we observe that:

The trunk, and sometimes the bud, as well as the fruit, of the hog-cabbage palm was eaten by stock in the early days, as well as recently. Aside from the direct evidence of the use of the bud for human food, we have the indirect evidence in one of the common names, viz: mountain-cabbage.

The comparison of the hog-cabbage palm with the royal-palm is rather persistently made, in spite of the fact that there is little in common either in the habit or the morphology of the two plants.

A decade ago a boatload of various-sized specimens of this palm was brought to Miami, Florida, from the Bahamas. The plants were sold as royal-palms and many of them may now be seen growing in the front yards along the avenues and streets of Miami. They have grown well and flower and fruit each year. Futhermore, on a recent visit to Upper Matecumbe Key we were informed that some wild royal-palms had recently been brought from Long Key and planted on a reservation. An examination of the specimens showed them to be *Pseudophoenix.* This incident disproved a report that had recently gained currency to the effect that this palm had been exterminated on Long Key.

A similar report concerning the colonies on Elliott's Key has been proved erroneous by Charles T. Simpson who wrote in a recent letter, "Last May, 1919, I believe, Mr. Somers of the boys school at Cocoanut Grove Florida took me over to Elliott's Key to show me a young royal-palm—he called it that—which he said grew wild on the island. We landed at the upper end of the island, and he took me a short distance thru the thick scrub near the bay side and above the landing, and there showed me a young palm, undoubtedly growing wild, which I at once recognized as *Pseudophoenix Sargentii.* There was another young one near the other side of the island not far from the Hawk Channel, and Somers told me of a large one some distance up the Key."

* J. A. Shafer, Journal of the New York Botanical Garden **11**: 157. 1910.

The first inroad on *Pseudophoenix* on Elliott's Key, aside from the destruction formerly wrought in clearing and burning of areas of hammock for making pineapple fields, occurred in 1897 when at least ten tall specimens were removed from the Key and taken to Miami. These ten trees were planted in a row on the line between the Flagler and the Tuttle properties south of Fourteenth Street. Several of these specimens died shortly after they were transplanted and in 1901, one tall plant was brought to the conservatories of the Garden. At present there are only two of the original ten specimens living where they were planted in 1897.

Other specimens, almost innumerable, are now flourishing, however, where they have been transplanted, and *Pseudophoenix* is assured not only of its place in the American flora, but in the ever-growing group of ornamental trees.

JOHN K. SMALL

SPRING AND SUMMER LECTURES

A course of forty public lectures will be given in the Lecture Hall of the Museum Building on Saturday and Sunday afternoons at four o'clock, beginning April 15. These lectures cover a wide range of botanical and horticultural subjects and are for the most part illustrated with lantern slides. A series of walks and talks has been arranged to cover the main features of the New York Botanical Garden during misdummer. In case of stormy weather, the inside collections will be inspected.

April 15. "Botanizing in British Guiana." Dr. H. A. Gleason

April 16. "An Early Start for the Home Garden."
Mr. Hugh Findlay

April 22. "Why Wild Flowers Should Be Protected"
Dr. W. A. Murrill

April 23. "English Gardens and the Newer Perennials"
Miss Hilda Loines

April 29. "Growing Seeds for Farm and Garden"
Dr. A. B. Stout

April 30. "The Cultivation of Wild Flowers"
Dr. E. T. Wherry

May 6. "Which Wild Flowers Should Be Protected"
Dr. W. A. Murrill
May 7. "Tramps and Camps Among Our Western Mountains" Mr. Leroy Jeffers
May 13. "Destructive Fungi" Dr. F. J. Seaver
May 14. "How Wild Flowers May Be Protected"
Dr. W. A. Murrill
May 20. "Late Spring Flowers" Mr. Kenneth Boynton
May 21. "Children's Gardens" Miss E. E. Shaw
May 27. "Lilies" Dr. A. B. Stout
May 28. "Iris" Dr. H. A. Gleason
June 3. Walks and Talks in the New York Botanical Garden
Dr. W. A. Murrill

(In case of rain, inside collections will be examined)

June 4. "A Naturalist's Rambles in Maine" Dr. G. C. Fisher
June 10. "European Influences in American Botany"
Dr. J. H. Barnhart
June 11. Walks and Talks in the New York Botanical Garden Dr. W. A. Murrill
June 17. "Roses and Their Culture" Dr. M. A. Howe
June 18. "Italian Gardens" Miss Emily Exley
June 24. "Flowers of the Summer Garden"
Mr. Kenneth Boynton
June 25. Walks and Talks in the New York Botanical Garden Dr. W. A. Murrill
July 1. "Destructive Insects" Dr. F. J. Seaver
July 2. Walks and Talks in the New York Botanical Garden
Dr. W. A. Murrill
July 8. "Water Plants" Dr. J. H. Barnhart
July 9. "Some Common Fungi: Good and Bad"
Dr. M. T. Cook
July 15. "Wild Life and Scenery of the Catskill Mountains"
Mr. S. H. Chubb
July 16. "The Newer Roses, Their Origin and Development"
Mr. Arthur Herrington
July 22. "The Plant Life of the Sea" Dr. M. A. Howe
July 23. "The Shakespeare Garden" Miss Esther Singleton
July 29. "Popular Books on Botany" Dr. J. H. Barnhart
July 30. "Orchids" Prof. E. A. White
August 5. "Gladioli" Mr. Kenneth Boynton

August 6. "How to Know the Mushrooms"
Dr. W. A. Murrill
August 12. "Correlations Between Animals and Plants"
Dr. F. J. Seaver
August 13. "What a Garden May Do for You"
Miss Grace Tabor
August 19. "The Seaweeds of New York and Vicinity"
Dr. M. A. Howe
August 20. "The Ancestors of Some of Our Living Plant Species" Dr. Arthur Hollick
August 26. "How New Types of Plant Originate"
Dr. A. B. Stout
August 27. "Botanizing on a Volcano" Dr. H. A Gleason

The Museum Building is reached by the Harlem Division of the New York Central and Hudson River Railroad to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue. Those coming by the New York, Westchester and Boston Railway change at 180th Street for crosstown trolley, transferring north at Third Avenue.

W. A. MURRILL

CONFERENCE NOTES FOR MARCH

A conference of the scientific staff and registered students of the Garden was held on the afternoon of March 1st.

Dr. W. A. Murrill discussed the genus *Stropharia*, referring to his published papers on tropical and western species and noting briefly the twenty species occurring in the eastern United States, six of which will be described as new in an article shortly to be published in *Mycologia*. He also compared this genus with *Hypholoma*, *Agaricus*, and other related groups of dark-spored gill-fungi, and proposed two new genera.

Mr. Kenneth R. Boynton gave a very interesting discussion and comparison of "Some American and Asiatic Species in Cultivation." Special mention was made of the Asiatic *Pachysandra terminalis*, the only other *Pachysandra* being our American

P. procumbens, of the Alleghanies; the Chinese tulip-tree, which is weaker than and not so hardy in cultivation as our own tulip-tree; the Japanese *Pieris*, one of our best cultivated broad-leaved evergreens, and our *Pieris floribunda* of the southeastern mountains.

A. B. STOUT
Secretary of the Conference

NOTES NEWS AND COMMENTS

One of the Australian shrubs blooming in the month of March in the cool house at range no. 2 was the manaki, *Leptosperum scoparium*. While not hardy in the east, this sand hill plant has been used effectively in reclaiming some barren spots of California's parks. In the aquatic house at range no. 1, the Florida swamp lily, *Crinum americanum*, has many large white fragrant blooms this month. In house no. 2, the same range *Medinilla magnifica*, from the Philippines, has nearly a hundred clusters of flowers, and will be full of bloom well into April. The Lady Banks rose, which has a history somewhat like *Rosa indica*, one of the progenitors of our hybrid tea roses, is blooming on the north wall of the large display house at range no. 2. The double white form has been grown in Europe since 1807 but it was not until the explorations of Augustine Henry and the Abbé David in China that the native home of *Rosa Banksiae* was found, in western China.

Specimens of several of the collections of bulbs of the spider lilies, *Hymenocallis*, and swamp lilies, *Crinum*, brought together from all parts of their geopraphic range in the United States, have produced flowers which have been painted in connection with the study of the spider lilies and swamp lilies now in progress at the Garden. Several of the more lately received collections of bulbs show signs of producing flowers.

A series of nearly six hundred specimens of the genus *Carex* is being incorporated in the permanent collections. These are from the herbarium of the late C. B. Clarke, who was a life-long student of the sedges of the world.

An important collection of herbarium specimens of flowering plants from Staten Island, brought together by Dr. Arthur Hollick, has been added to the local flora herbarium.

Dr. Stout has an interesting collection of rare and distinct forms of *Narcissus*. The bulbs were collected wild in Spain and shipped to the Garden late last summer. They were potted up and held in cold frames where they are now blooming. They are all new to the Garden and most have not been widely cultivated. For the most part they are small and very delicate plants but a few inches in height with flowers very much smaller than the florists' types. They are being grown in connection with hybridization studies and will be propagated from year to year.

Fifteen hundred plants of the two cultivated types of the Chinese cabbage are now in flower in the experimental greenhouses. These plants are being studied with reference to an interesting and peculiar type of sterility involving incompatibility in fertilization—a type very commonly seen in cultivated plants.

An advanced class in biology from Evander Childs High School with Mr. Hastings, spent the afternoon of March 15 at the Garden examining the museum and herbarium collections of fungi and algae.

An informal bird club has been holding meetings in the Garden for several years to observe the resident and migratory birds in the hemlock grove and in the meadows of the Bronx River. On the morning of March 19, over a dozen bird students, equipped with field glasses, gathered on the boulder bridge and compared notes. While there, a pair of wood-ducks flew overhead, while crows, grackles, robins, redwings and blackbirds could be heard and seen in the nearby trees. Not far away, the chickadees were feeding on suet in the spicebushes, and downy woodpeckers were waiting on the branches above for their turn. The cardinal, which had been seen there for several weeks, could not be found. The two northern shrikes were alos

in hiding, although usually in evidence during most of the day about the thorn bushes. A pair of sparrow hawks flew west, uttering their peculiar cry; while a blue-jay scratched in the leaves beneath the beech tree where the humming bird's nest was found last year. But the event of the day was the morning chorus of fox sparrows in north meadows, where hundreds of these birds were feeding among the weeds and bushes. The song sparrows are also abundant there, but their songs were feeble and hardly noticeable when their larger migratory cousins began to sing.

Dr. W. C. Coker visited the Garden during the latter part of March to consult the mycological herbarium and library.

Members of the Garden and their friends inspected conservatory range 2 on Saturday, March 18, at three o'clock. Collections of orchids, cycads, ferns, cinerarias, and other plants were shown by the Garden staff and Mr. Boynton gave a brief talk on certain interesting species in bloom in the conservatories at this season of the year.

The following visiting botanists have registered in the library during the winter months: Prof. L. O. Overholts, State College, Pa., Professors L. H. Bailey and H. M. Fitzpatrick, Ithaca, N. Y., Prof. A. W. Evans and Mr. Albert J. Hill, New Haven Conn., Prof. W. C. Coker, Chapel Hill, N. C., Dr. S. F. Blake, Mr. W. W. Eggleston and Miss Vera K. Charles, Washington, D. C., Dr. Ernest Antevs and Miss Vivi Laurent, Stockholm, Sweden, Prof. C. H. Ostenfeld, Copenhagen, Denmark, and Dr. Morten P. Porsild, Disko, Greenland.

ACCESSIONS

PLANTS AND SEEDS

4 plants for Conservatories. (Given by Miss Grace H. Simonson.)
153 plants for Iris Garden from France. (Given by E. Turbat & Co.)
1 plant of *Zygocactus* for Conservatories. (Given by Miss Clara Manz.)
4 plants for Rose Garden. (Given by Mrs. M. J. Fox.)
2 plants for Nurseries. (Given by Mr. Wm. Bolton.)

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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIII April, 1922 No. 268

JOURNAL

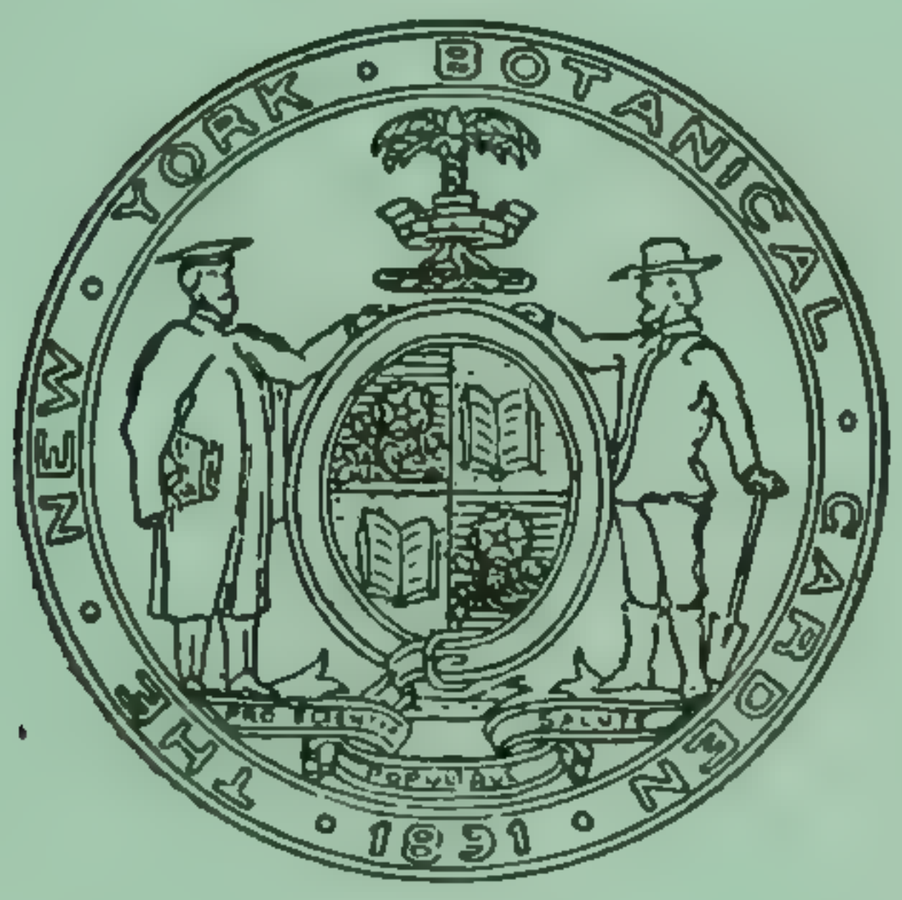
OF

The New York Botanical Garden

EDITOR

R. S. WILLIAMS

Administrative Assistant



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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA

INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

VOL. XXIII April, 1922 No. 268

BOTANICAL INVESTIGATIONS IN PORTO RICO

TO THE SCIENTIFIC DIRECTORS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen:—Pursuant to permission given me by the Board of Managers, I was absent from the Garden during the period between January 21st and April 10th, 1922, occupied in collecting plants and specimens for the Garden, in Porto Rico, and in obtaining data for a flora of that island and those adjacent, for publication by the New York Academy of Sciences as parts of the Scientific Survey of Porto Rico and the Virgin Islands. I was accompanied by Mrs. Britton and by Miss Margaret S. Brown of Halifax, Nova Scotia; both ladies gave efficient aid in the collection and preservation of specimens.

This Scientific Survey of Porto Rico and the Virgin Islands was commenced by the New York Academy of Sciences in 1913, in cooperation with the insular government of Porto Rico, the American Museum of Natural History, the New York Botanical Garden, the Department of Geology and of Anthropology of Columbia University and with other American institutions. It has since been prosecuted, whenever practicable although much interrupted by the war with Germany. The materials brought together have already formed the basis of numerous noteworthy contributions to knowledge published by learned societies and by the cooperating institutions. Publication of the final reports was begun by the Academy in 1919, and three parts of the geological volumes and two of paleontology have now been issued under the editorship of Professor R. W. Tower of the American Museum of Natural History. Additional parts

of the geological volumes are ready for the press, to be followed by those dealing with the botany and vegetable resources, the zoology, archaeology and anthropology, as rapidly as funds for printing become available. The completion of the work will make the geology and natural history of Porto Rico and the Virgin Islands the key to natural science knowledge of the West Indies.

The objects of this trip were to supplement our information about the vegetation obtained during several previous visits to the region, from study of many specimens obtained by other collectors in former years to ascertain, now that the geological field work in Porto Rico has been completed, such distribution of species as may be governed by soils of different mineral composition, and to increase the representation of Porto Rican plants in the collections of the Garden, with duplicates for exchange with other gardens and museums. These objects were satisfactorily accomplished over considerable areas of the island, special attention being given to the northern and southern coastal plains and to the higher mountain summits of the central districts.

From our base at Coamo Springs, occupied for seven weeks, we studied the southern districts from Juana Diaz to Yabucoa, the valley of the Coamo River and contiguous hills being given the most intensive examination. All the lower part of this valley is in the poorly consolidated loam, gravel, and sand of the Santa Isabel formation, the most recent deposits geologically. The rainfall is low; but the soil is highly fertile under irrigation, all the water supplied by the stream being thus utilized by means of a massive concrete dam forming the Coamo Reservoir, and led by distributing canals through the sugar-cane fields for several miles toward the southern coast. The several affluents of the Coamo rise well up on the southern slopes of the Sierra de Cayey, forming an extensive water-shed, and the river is subject to very rapid rise and fall. Even in the dry season, during our visit, heavy showers over the water-shed were reflected in sudden rises which gave anxiety about the passage of fords by motor-car. Numerous deep arroyos, dry at this time of the year, with vertical walls up to sixty feet in height, which are cut into the Santa Isabel formation, are a physio-

graphic feature of extraordinary interest, the wonder being that their walls can remain vertical, with scarcely any caving, in this loosely consolidated material. Extensive river-terraces are also a striking feature of this formation, rising at Coamo Springs to over two hundred feet above the sea, deeply intersected by the vertically walled arroyos. In these as well as along the river and on the hills exists a varied natural vegetation of trees and shrubs. The largest trees are the ceiba or silk-cotton (*Ceiba pentandra*), very characteristic with its widely and irregularly spreading branches, often supporting many air-plants, its prickly trunks and limbs, palmately compound leaves, and rather inconspicuous purplish flowers followed by hard oblong pods containing cottony-appendaged seeds, whence the English name. The bucaro (*Bucida Buceras*), called water grigri in St. Thomas, reaches great size along the river; it is elm-like aspect and has valuable wood. The jaboncillo or soap-berry (*Sapindus Saponaria*) rivals it in height, with pinnate leaves and globular, viscid fruit the size of a marble.

Very striking when in bloom is the bucare or sword-flower (*Erythrina*), the tufts of scarlet narrow flowers appearing before the large clover-like leaves, its stems and twigs formidably prickly. Other prickly-trunked trees of this dry region include two kinds of yellow wood, espino (*Zanthoxylum*), and the hog-plum or jobo (*Spondias Mombin*), its branches tipped by beautiful large clusters of small white flowers, its yellow plum-like fruit edible. Characteristics of the region, and existing only in the southern districts of Porto Rico is the hueso or palo de tortuga (*Phlebotaenia Cowellii*), a large tree of the gay-wings family. This is one of the most elegant of all trees when in bloom, its slender, nearly upright branches being covered with innumerbale small violet flowers, remarkable for scarcely wilting at all before dropping their petals, even when cut branches are brought into the house. Its botanical name commemorates the late Mr. John F. Cowell, Director of the Buffalo Botanical Garden, who was with us when we first saw it in bloom near Coamo Springs in 1906. We have given this beautiful plant the English name violet-tree. Three kinds of a genus (*Tabebuia*) form fine flowering trees, two of them with large pink or nearly white flowers being much planted in parks, gardens and along

roads. They have light-colored, hard, durable wood and are here known as roble, which is the Spanish name for oak, and in the Virgin Islands as white cedar. The Spanish cedar (*Cedrela*) very valuable for its wood occurrs sparingly. *Cordia nitida*, a tree of a family including the heliotrope, is known to the Porto Ricans as cereza (cherry) on account of its red cherry-like fruit, which is greedily eaten by the wild doves. A tree standing near our house at Coamo Springs was loaded with fruit when we arrived, which was nearly all devoured by the birds that came to it morning and evening. After this the tree bloomed profusely, covered with its small white flowers, and set another crop of fruit before we came away.

Mocha (*Andira jamaicensis*), of the pea-family, with hard durable wood, pinnate leaves, and terminal clusters of purplish flowers, opening at the close of our stay, is abundant on the terraces and elsewhere. Its fruits are round, hard and contain but one seed, very different from the pods of most of its relatives. On these river-terraces the trees are often isolated and spaced apart, forming attractive natural parks.

The gumbo limbo or West Indian birch (*Elaphrium Simaruba*), of no relationship to the true northern birches, but with a characteristic brown papery bark resembling somewhat that of our river-birch, is abundant and much planted for roadside shade in the dry districts. It will not survive in regions of higher rainfall. Fiddle wood or pendula (*Citharexylum fruticosum*), on the contrary, inhabits naturally both wet and dry regions, reacting to the climate, however, in that its foliage is for the most part densely hairy under dry conditions and nearly or quite smooth in wet districts. Its flowers are small and white in long, slender, terminal, nodding clusters. Guazum (*Guazuma*), an irregularly branching tree, has round, hard, dry, rough, fruit nearly an inch in diameter, commonly fed to horses. The most abundant naturalized tree of the region is the flamboyant or royal poinciana (*Delonix regia*) native of Madagascar, widely planted along roadsides and locally springing up and forming groves. At this time of year its long, thin, woody pods hang abundantly from the branches and in summer its flame-colored flowers are a blaze of glory.

Among other trees which are less abundant, mention may be

made of the West Indian nettle-tree (*Celtis*) with foliage and fruit quite similar to those of the northern kinds, the almoncillo or ausubo (*Sideroxylon*) with very valuable wood and hard yellow glutinous fruit, borne along its twigs, the size of a small plum; and cojoba (*Piptadenia peregrina*), a medium sized tree of *Mimosa* relationship with nearly black, very rough bark, finely divided leaves, and minute numerous white flowers in many small globular clusters. The rarest tree of the Coamo region, and one of the scarcest in Porto Rico, is a beautiful silver-palm (*Coccothrinax*), of which only a few plants are known to exist, on a hillside of the Coamo Springs limestone and in an arroyo nearby. The tallest of the colony is about twenty feet in height and from it we obtained a good supply of seeds, and under it seedlings which we planted in a pot and personally escorted to the Bronx.

Many kinds of shrubs inhabit the Coamo Valley, conspicuous among those in bloom at the time of our visit being the yellow-flowered retama prieta (*Cassia polyphylla*) and *Pictetia aculeata* of the pea-family. The latter is tree-like, but grows with several stems together from the same roots and sometimes reaches thirty feet in height on the river-terraces. Along the southern coast and reaching up the valley nearly to Coamo Springs, the yellow-flowered *Parkinsonia*, palo de rayo, made the plains golden by its great abundance. Lilac-flowered, leguminous shrubs of the genus *Sabinea* or *Corynella*, called retama, formed elegant leafless wands up to six feet long. A curious *Gesneria*, some six feet high, occasional in the arroyos, has large, oblique, yellowish flowers, few or solitary at the tips of its branches. Parasitic shrubs of the mistletoe family, of several species, are abundant on trees of various kinds, forming large evergreen tufts and festoons in some instances more conspicuous than the foliage of the trees on which they feed.

Climbing and twining vines of many species are present. The hirsute *Tournefortia* forms large masses, its small white flowers in large and broad terminal clusters having the odor of heliotrope, to which it is related. Bejuco de costellas (*Serjania*) has clusters of small white flowers followed by red three-winged pods and pliant branches used in basketry. A fine species of *Exogonium* with elegant crimson flowers resembling those of

the cypress-vine grows on the rocky hills, and two vines related to our trumpet creeper, one with bright yellow, the other with white flowers, are abundant. *Proustia Krugiana*, an elongated climber of the thistle family with yellow flowers, exists only in these dry parts of Porto Rico.

Xerophytic conditions are also reflected by the local abundance of several species of cacti small and large, especially along and near the coast and on the tops and southern sides of hills, and with or near them the Porto Rico century-plant (*Agave portoricensis*) forms extensive colonies, with a density on some hill tops which makes progress impossible without vigorous work with a machete. Herbaceous species are neither numerous nor conspicuous in these districts, with the exception of weeds of cultivated lands. Some interesting species exist along the streams and in the saline areas near the coast, of which the most characteristic is the trailing amaranth-relative *Achyranthes portoricensis*. This locally carpets the ground and grows only in southern Porto Rico and the Virgin Islands. It is also too dry here for the existence of many species of ferns or mosses. Two kinds of resurrection ferns, however, inhabit cliffs of eruptive rock, their leaves inrolled except during and after rains. Mrs. Britton detected in the same habitat a most interesting moss of the genus *Erpodium*, hitherto unknown from Porto Rico, and collected a liberal supply for distribution to her bryological correspondents. Only one kind of orchid was found, a small *Oncidium* growing on the branches of a shaded calabash tree.

From Coamo Springs several excursions were made to the mountains, three days being given to studies of the forests, slopes and stream-valleys of the Toro Negro district at elevations of 2000 to 3000 feet, reached by motor-car on the new and unfinished road which is to connect Juana Diaz on the southern side with Cyales on the northern slope of the central mountain axis. Proceeding northward from Juana Diaz, through Villalba and then ascending rapidly on the well-graded continually curving road-bed, wonderfully beautiful views of mountain, valley and ocean are had in bewildering succession. As we approach the divide at Ala de la Piedra, about 2500 feet up, the much heavier rainfall is indicated by the changed character of the vegetation, and within much less than a mile the change

has become so complete that we see scarcely any of the trees, shrubs or other plants which grow upon the southern slopes. They are replaced by a much more luxuriant, denser and more varied vegetation, and there are living brooks and streams in rocky valleys flowing northward with rapids and water falls. The Doña Juana Cascade, to which the subgrade of the road is now essentially completed through extensive blasting of igneous rocks, is most attractive, a brook here falling nearly vertically for perhaps a hundred feet into a deep clear pool immediately alongside the road, which is to have a bridge at this point, thus leaving the beautiful natural features unchanged.

Ferns of great beauty and variety abound, from the stately elegant tree-ferns with spreading leaves up to ten feet long in tufts on trunks ten to twenty feet high, through many smaller kinds to the delicate filmy-ferns which adorn trunks of the forest trees. Mosses clothe rocks, banks, and trunks, and the mountains from about 3000 feet to their summits, are covered by the beautiful palma de sierra (*Euterpe globosa*), forming forests of considerable density with some other trees, shrubs and climbers. Orchids of several kinds are abundant on trees and rocks. Two species of *Epidendrum*, one with yellowish flowers the other purple, were collected, as well as several ground orchids. Large bromeliads of kinds different from those of the dry regions, form great tufts on trees. The forests except those of the mountain palm, which are composed largely of that alone, contain a great number of different trees growing singly or but few together, a condition familiar to tropical foresters, which makes the lumbering difficult and expensive. *Hillva*, a shrub related to cinchona, with large, white, salverform flowers, was in bloom along the streams, together with a considerable variety of herbaceous plants. Among them in grassy places a delicate St. John's wort (*Hypericum diosmoides*) with little yellow flowers, and the West Indian mountain starwort (*Alsine*) both reminding us of related plants of the north temperate zone though existing here through the subtropical climate of the mountains. Indeed, at these elevations in Porto Rico, as in other West Indian islands, there is no necessary discomfort from heat and we can walk and climb about as easily as in the north. We made botanical collections also in the mountains about Aibonito, where the

transition from dry to wet vegetation may also be observed.

In the mountains between Guayana and Cayey, where the mountain palm forest was entered at an elevation of about 2700 feet, some of the elegant forest plants were found in bloom. Among them grows the bejuco colorado (*Rudolphia volubilis*), a long vine of the pea family, existing in Porto Rico only, with great clusters of rose-colored, narrow flowers, each about two inches long, and bean-like pods. *Guzmania Berteriana*, of the pine-apple family, with long spikes of scarlet flowers, is also endemic in Porto Rico. This forest yielded us more kinds of mosses than any other visited during the trip.

A study was made of one of the mountains of the Sierra de Yabucoa between Maunabo and Yabucoa in the southeastern part of the island, where a small forest area remains at the summit altitude of about 1800 feet, and the slopes are largely composed of immense irregularly eroded masses of granitic rock with many interesting ferns, peperomias and other herbaceous vegtation upon and among them, the endemic Porto Rican *Begonia* being much in evidence as in the other mountain forests. *Lobelia portoricensis*, a tall species five or six feet high and also endemic, occurs at the summit, where the dominant trees are the achiotillo (*Alchornea latifolia*) and the lechesillo (*Sapium Laurocerasus*), both of the spurge family, with a few specimens of the mountain palm.

On March 18th we moved our base of operations from Coamo Springs to Condado, near San Juan, on the northern coast, and gave nearly three weeks to studies of the northern coastal plain and its curious haystack hills of the Arecibo limestone. Extensive areas of nearly white, fine-grained, silica sand with an undulating surface locally rising into broadly rounded hills, are a characteristic of this coastal plain, reaching in some places nearly or quite to the coast, and in others to the northern bases of the limestone hills; and from the erosion of this limestone the sand seems to have been derived. Excavations for sand pits and for wells show it to be of considerable thickness, and the areas extend more or less continuously from near Loiza on the east to beyond Manati on the west, a distance of at least 30 miles, and in places they are half a mile or more wide. This sand supports a native vegetation of plants whose physiology

requires sterile soil for their existence. On the higher and drier parts we find among other characteristic species, and here endemic, a partridge-pea (*Chamaecrista mirabilis*) with rather large bright yellow flowers close to the ground. The low shrub *Mitracarpus portoricensis*, with numerous globular clusters of small, bright-white flowers, is quite decorative. *Aeschynomene portoricensis*, a small, trailing legume with jointed pods, and another pea-like vine, jicama (*Calopogonium orthocarpum*), with pure blue small flowers were observed, but the most conspicuous plant in bloom at that time was a small tree or shrub (*Ouratea littoralis*) of the ochna family, having fragrant, bright-yellow flowers in large bunches and growing only in Porto Rico and the Virgin Islands. In wet places and on the shores of the fresh-water lakes Laguna Tortuguera and Laguna Yeguada, a great variety of herbaceous species were found, among them three kinds of yellow-flowered bladderworts like those of the sandy parts of the Atlantic coastal plain of the eastern United States, yellow-eyed grasses (*Xyris*), several kinds of sedges and of true grasses, sphagnum mosses, and a fine white-flowered water-snowflake (*Nymphoides*)—all reminding us of wet grounds in southern New Jersey. In the lagoons and canals water-lilies, pond-weeds and other aquatics locally abound.

We pass very abruptly from these sandy stretches northward to the craggy limestone hills where the natural vegetation changes quite as abruptly, there being, indeed, scarcely any species in common. The rainfall and the temperature of the two formations being essentially the same, there seems to be no doubt that we have here as striking an illustration of the reaction of plants to soils as need be looked for. Very characteristic of these crags is the tall, slender, smooth Ilume palm (*Gaussia attenuata*), topped by about 4 rather short pinnate leaves, rising above the rest of the forest and thus conspicuous upon the sky-line growing naturally only in Porto Rico. Another endemic palm, palma de Coyor (*Bactris acanthophylla*), its trunk and pinnate leaves copiously armed with long black prickles, its red fruit pulpy and date-like, abounds locally in these hills. A third endemic fan-leaved palm, (*Thrinax* sp.) low in stature and apparently scarce, the leaves of which were collected some twenty years ago and preserved at the United States National Museum, was traced,

after long search, to its home on crags near Vega Baja, and its fruit collected for the first time by botanists. We also brought out two young plants which we hope will grow at the Garden.

The vegetation upon these limestone hills is usually of very great density, trees, shrubs and woody vines interlocking, making study slow and difficult, and in most places there are vertical cliffs above the talus which effectively block access to their summits. Ferns and mosses abound and specimens of many species were obtained. On one of these hills near Cataño we collected, after arduous climbing, foliage, flowers and fruit of one of the most remarkable of all trees, the morelon (*Coccolobis rugosa*). We had observed, from the plain, conspicuous red objects which were unfamiliar; but closer access showed these to be young leaves, flowers and fruits of a slender, nearly unbranched tree up to thirty feet high, its trunk not more than four inches through, its thick, wrinkled, orbicular leaves a foot or eighteen inches in diameter, its brilliant red small flowers in tail-like clusters up to two feet long, waving in the trade-wind. A native with a machete felled one of the trees for us and fine specimens were gladly added to our rapidly increasing collection.

A day was given to an inland excursion to Las Cruces, our object being the study of the palm-capped mountain Cerro de las Pinas, accessible from Las Cruces on a good hogback trail on which we climbed from about 1500 to about 2400 feet and found interesting forest vegetation at the higher altitudes on eruptive rocks, and obtained specimens of some plants not seen by us elsewhere, including two mistletoe-parasites, one a *Phoradendron* with straight, stiff upright, leafy branches, the other a pendent *Dendropemon*. A fine tree-fern and several smaller ferns are abundant there, and several kinds of orchids were found. The dominant tree, other than the mountain palm, is a melastomad with very dense foliage, its dark green leaves nearly vertical in position, giving a curious effect. Another day was occupied in a drive to Fajardo at the eastern end of the island, giving us enjoyable views of the high Luquillo Mountain and of the ocean, a well as the islands Vieques, Culebra and St. Thomas to the east. Botanical collections were made enroute near and along the northern coast at several points, a broad-leaved calabash-tree, growing near Luquillo bearing both flowers

and fruit, being of especial interest. Our last afternoon in Porto Rico was spent at the Insular Agricultural Experiment Station at Rio Piedras, studying the plantations there under the guidance of Mr. J. Matz, Acting Director.

We collected altogether some 4000 specimens included in 1304 field numbers. We were everywhere received with the greatest hospitality, and aid ard information given us, almost eagerly, wherever and whenever required. We are especially indebted to Hon. John A. Wilson, Commissioner of the Interior, to Hon. Juan B. Huyke, Commissioner of Education, to Hon. Ramon Gondia Cordova, Assistant Commissioner of Agriculture, to Mr. J. Matz and Dr. Carlos E. Chardon of the Insular Experiment Station, who accompanied us on several days in the field and gave us the advantage of their knowledge of fungi, to Professor and Mrs. F S. Earle of Aguirre, who were also in the field with us on several occasions, recalling former association with them at the Garden, to Mr. Harold I. Sewell of Naguabo, recalling former aid when we explored that region in 1914, and to Mr. and Mrs. Charles Hartzell at Condado.

Respectfully Submitted,
N. L. BRITTON,
Director-in-Chief.

NOTES, NEWS AND COMMENT

Dr. Francis W. Pennell, Curator of Plants at the Academy of Natural Sciences of Philadelphia and until recently Associate Curator of this institution, and Mr. Ellsworth P. Killip, Aid in the United States National Museum, will sail on April 25th for five months plant-collecting in the central and western cordilleras of the Andes of Colombia. Mrs. Pennell will accompany her husband during the first half of the course. The party will land at Buenaventura, on the west coast of Colombia, and proceed by rail to Cali in the Cauca valley. There they will obtain a native assistant and purchase riding and pack mules. The first overland excursion will be southward to Popayán, where collections will be made on some peak of the central Andes and on Cerro Munchique on the western Andes. From thence the expedition will work north through the beautiful Cauca

Valley and eventually to Medellin. Excursions will be made into different upland areas of the two cordilleras, the purpose being to compare the isolated upland floras of these chains. The chief work will probably center about Popayán in June, in the Quindio or northern Cordillera Centrál in July and early August, and in the almost unknown northern Cordillera Occidentál in late August and September.

Over a hundred Girl Scouts from Bronx House, led by Miss Merchin and several able assistants, made a tour of the Garden on Saturday, March 25, under the guidance of members of the staff. They were joined by a visiting troop from Brooklyn.

Professor C. R. Orton of Pennsylvania State College has been spending a few days at the Garden looking over literature relative to his work on North American fungi of the genus *Phyllachora*.

Miss Silence Rowlee recently spent several days at the Garden looking over and determining the fungi collected by Professor W. W. Rowlee and H. E. Stork of Cornell University in Costa Rica. The list will be published in *Mycologia*.

Dr. Small expects to leave on April 13th for a botanical trip in Florida where he will continue his explorations.

A foundation is being built for the new fence along Pelham Avenue. The iron fence along Southern Boulevard is being painted. The ground around the Mansion is being leveled to improve the landscape effect.

Meteorology for March: The total precipitation for the month was 4.85 inches, of which 0.35 of an inch (3 and ½ inches by snow measurement) fell as snow. The maximum temperatures recorded for each week were as follows: 52° on the 3rd, 57° on the 12th, 59° on the 14th and *77° on the 26th*. The minimum temperatures were : *15° on the 1st*, 25° on the 9th, 18° on the 18th and 25° on the 23rd. Ice disappeared from the middle lake in the night following the 15th.

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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIII May-June, 1922 No. 269-270

JOURNAL

OF

The New York Botanical Garden

EDITOR

R. S. WILLIAMS

Administrative Assistant

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN
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On shore of Cuthbert Lake, southern end of the Florida peninsula.—A small colony of the saw-cabbage palm in a hammock. The several stems —really branches—arise from a branching rootstock or main stem system. The erect stems resemble stout fishing poles. They are light and very fibrous, and thus being pliable and well anchored in the ground the colony is able to successfully resist the fiercest hurricanes.

JOURNAL
OF
The New York Botanical Garden

VOL. XXIII May-June, 1922 No 269-270

THE SAW-CABBAGE PALM

THE HISTORY AND DISTRIBUTION OF PAUROTIS WRIGHTII

With Plates 271—273.

Palms have always been interesting, even fascinating plants; and although they may be readily recognized even by those with the least technical knowledge concerning them, they are, nevertheless, of a vast variety.

The United States is merely on the northern edge of the geographic range of the palms of the New World. Yet, south of the latitude of Cape Hatteras on the Atlantic coast and the San Bernardino district in California—the northern outposts of the American palm habitats—not less than fourteen well marked species of the palm family grow naturally.

They largely prefer the lowlands. Some of these species are widely distributed geographically; others are restricted to quite limited areas; but none have altitudinal distribution beyond a few hundred feet.

They favor the east. One species alone occurs naturally on the Pacific side of the continent, while the other thirteen, except two species, are restricted in their distribution to the Gulf and Atlantic Coastal Plain. Among these the blue-stem (*Sabal Adansonii*) and the needle-palm (*Rhapidophyllum Hystrix*), range beyond the bounds of the Coastal Plain and extend their ranges a short distance into the Piedmont. Those species, in the Coastal Plain north of southern peninsular Florida, are more

or less associated with other palms, such as the cabbage-tree (*Sabal Palmetto*), the scrub-palmetto (*Sabal Etonia*), and the saw-palmetto (*Serenoa repens*[1]).

In southern Florida seven other palms occur. Some of them have been well known there for many years, while the discovery of others has been comparatively recent.

The latest palm to be discovered in Florida—*Paurotis Wrightii*, sometimes popularly known as the saw-cabbage palm —is one of our more interesting and rarer palms. Closely associated with the lower parts of the Lossman's River limestone of the Ten Thousand Islands, the Cape Sable Region, and the extreme southern end of the Florida peninsula, it occurs in the least accessible parts of the State. And this is perhaps why, although thirty years had elapsed since its discovery on the North American mainland, it was until quite recently so utterly misinterpreted.

In May, 1887, Pliny Ward Reasoner[2] during a short vacation trip along the lower western coast of Florida, by boat, discovered the palm under discussion in the royal palm region or district of the Cape Romano region. Neither flowers nor fruits were then secured.

In the fall of the following year, shortly after the death of Pliny Reasoner, his brother, E. N. Reasoner[3], made a pilgrimage

[1] SERENOA REPENS (Bartram)

Corypha repens Bartram, "frondibus expansis, flabelliformibus, plicati., stipit. spinosis."

Chamaerops serrulata Michx. Fl. Bor. Am. **1**: 206. 1803.

Serenoa serrulata Hook; Benth. & Hook, Gen. Pl. **3**: 926. 1888.

[2]Pliny Ward Reasoner was born May 6, 1863, at Princeton, Illinois, where he received his education and at an early age became interested in botany and horticulture. About 1883 he went to Florida, establishing the Royal Palm Nurseries at Oneco, and in 1885 formed a partnership with his brother, E. N. Reasoner, under the name of Reasoner Bros. He was horticultural superintendent in charge of the subtropical exposition at Jacksonville, 1887-88, and one of the three Florida commissioners to the Atlanta exposition of 1888; and he was becoming widely known as a cultivator of tropical and subtropical plants and a contributor to horticultural literature when an attack of yellow fever suddenly terminated his career, at the early age of twenty-five. He died at Manatee, Florida, September 17, 1888. —John Hendley Barnhart.

[3] Egbert Norman Reasoner was born at Princeton, Illinois, May 24, 1869.

to the region just referred to above, where he secured seeds of this same palm and also a few plants; but it was not until a decade later (1898) that the requisite flowers and fruits were forthcoming. These were found near the source of the Chokoloskee River, as will be seen by subsequent quotations.

Specimens were later sent to Charles S. Sargent[1] at the Arnold Arboretum, and he then associated them with the genus *Serenoa*, and described the palm as *Serenoa arborescens*.

Professor Sargent, in a note accompanying the original description[2], said:

"This second species of Serenoa differs from the type of the genus, the well-known saw palmetto of the southern states, in its arborescent habit, more elongated spadix, much smaller flowers, and smaller globose fruit and seeds, and is certainly a most interesting addition to the trees of the United States. The existence of an undescribed palm on the Chockoloskee river was known to me as long ago as 1887, when it was discovered without flowers and fruit in the Royal Palm Hummock, not far from the town of Everglade, by the late P. W. Reasoner, of Oneco, Florida; but it was not until the past season that I obtained the flowers and fruit from Mr. R. G. Corbitt of Immockalee, Florida, who has found this palm growing abundantly in the swamps about thirty miles southeast of Lake Trafford, near the head of the Chockoloskee. In December 1898, seeds of *Serenoa arborescens* were distributed from the Arnold Arboretum as "New palm from the Florida everglades."

Neither of the geographical designations for the original locality of this palm are correct, in other words *Serenoa arborescens* was not discovered near the Chokoloskee River nor in

---

He joined his brother, Pliny Ward Reasoner, in Florida, in the fall of 1885, and although his brother died only three years later the firm name of Reasoner Brothers has continued in use until the present time. He has done much collecting of seeds and living plants in tropical Florida, has traveled widely in the United States, Europe, and the West Indies, and has contributed to Bailey's Cyclopedia of American Horticulture and Standard Cyclopedia of Horticulture.—J. H. Barnhart.

[1] See under "Bucaneer-palm," Journal of the New York Botanical Garden **23**: 33–43. 1922.

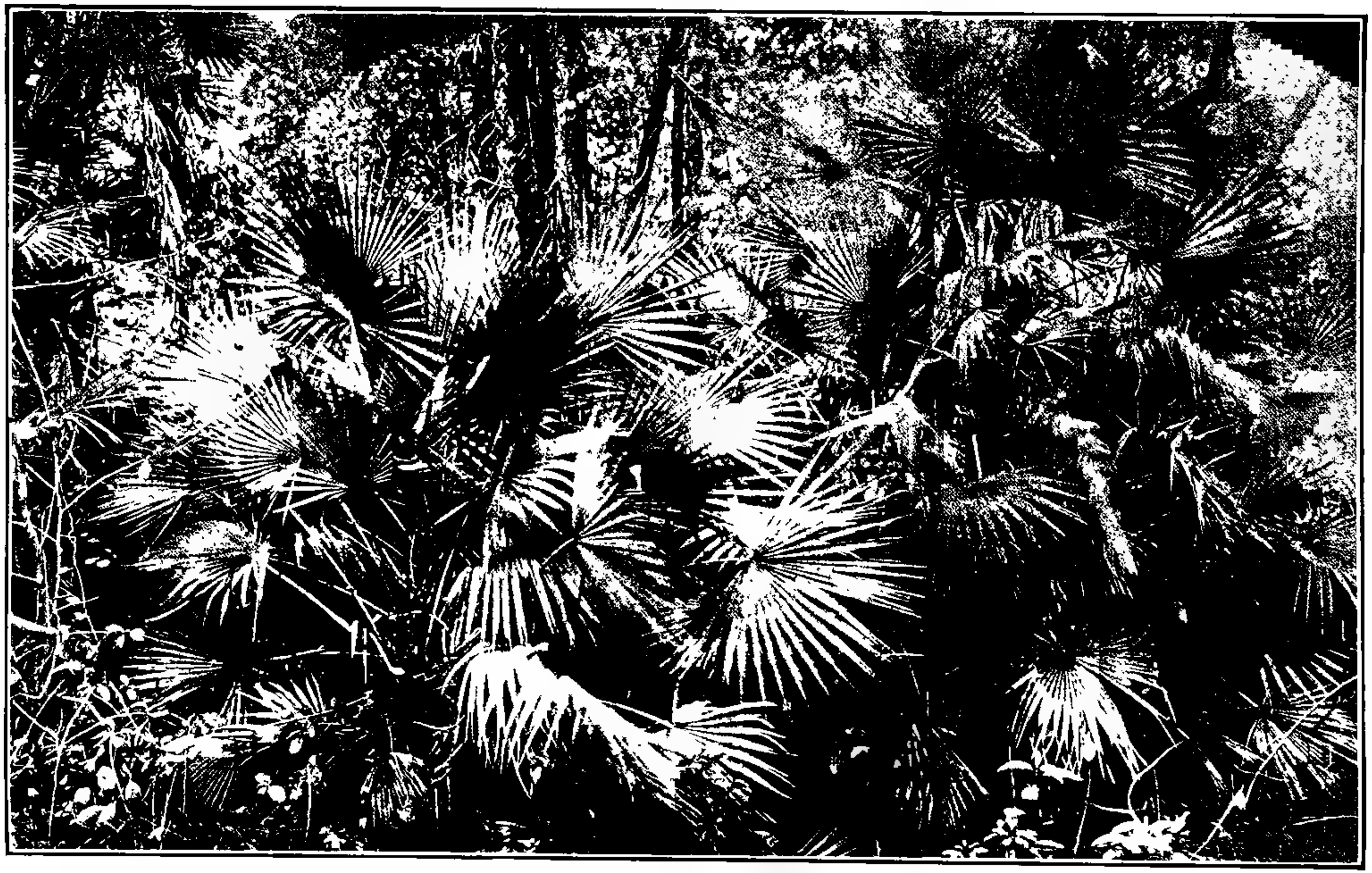
[2] Botanical Gazette **27**: 92. 1899.

the Royal Palm Hammock; but was first collected in a "point of cypress" several miles northwest of the headwaters of Allen River, a locality midway between the two stations cited above which are twenty odd miles distant from each other. The type locality was visited by the writer in the spring of 1921. It is true that there were three royal-palms growing in this point of cypress at the time of the discovery of the "Serenoa", but it was in no sense the Royal Palm Hammock which is far to the westward and back of Marco. These three royal palms were killed in the "freezes" of 1894 and 1895, which occurred only six weeks apart. Parts of the column-like trunks of the royal palms are still standing, but the species (*Roystonea regia*) is now extinct there and it is not likely it will be reestablished through natural agencies. The geographic range and the number of individuals of the royal palm in Florida have evidently been shrinking for many years as a result of destructive natural agencies.

In connection with the description in the Silva[1], published three years later, where the palm was also figured, Professor Sargent says:

"At the time of its discovery neither flowers nor fruit were collected, but in October, 1888, Mr. E. N. Reasoner visited the Chockoliskee River and obtained a few seeds, a stem for the Jesup Collection of North American Woods in the American Museum of Natural History, New York, and a few small plants. One of these has been grown in my Garden in Brookline, Massachusetts, and is now about eight feet high. In the spring of 1898 Dr. Robert Ridgway, the distinguished ornithologist, informed me that his guide on a recent journey which he had made to the southeast of Fort Myers on the Caloosahatchee River, Mr. R. G. Corbitt of Immockalee, had told him of a tall slender Palm in the Cypress swamps thirty or forty miles to the southeast of Lake Trafford and near the head of the Chockoliskee; and through Mr. Corbitt I obtained in 1898 leaves, flowers, and ripe fruits of this interesting Palm, which proved identical with the one discovered by Mr. Reasoner, and a second species of Serenoa."

[1] Silva of North America **17**: *77. pl. 734.* 1902.



On shore of Cuthbert Lake.—Young shoots of saw-cabbage palm arising from the stolons of a small colony, several tall stems of which may be seen standing behind the leaves. Starting as a single stem from a seed, a colony sometimes of more than a hundred stems is formed by the continuous outward development of stolons

In a later paper[1] on the genus, Sargent gives a further note n the geographic distribution of the species in question, which as by that time transferred to the genus *Acoelorraphe*. It reads: "An additional station for *Acoelorraphe arborescens* is at the ead of East River, White Water Bay, where it was collected y A. A. Eaton on March 22, 1905, and by J. B. Ellis in June and ctober, 1908."

Just twenty years after the discovery of *Serenoa arborescens*, 1 1907, John J. Soar and Marion Soar, while on a plant unting excursion, found their way into a large bay, apparently ill nameless, lying east of Maderia Bay at the southern end of ıe Florida peninsula, and north of Big Boggy.

There they discovered a palm unknown to them. They arried home a piece about as large as one's arm and later planted on the bank of the Little River north of Miami. It was the ıme as the plant discovered earlier by Mr. Reasoner. This articular specimen has grown into a beautiful many-stemmed ırub at least twenty feet tall.

Interest was again awakened in Florida and West Indian palms ıortly after the beginning of the present century. In 1902 O. F. ook[2] described a new genus with one species[3] from specimens ollected on western Andros, Bahamas, by John I. and Alice R. orthrop.[4] When the Andros specimens came to light matters ecame more interesting. It was seen that the Andros plant, dging from the specimens just referred to, was the same as *opernicia Wrightii* of Cuba. Soon after it became evident that ıe Andros, Cubans, and Floridan plants represented not only ıe genus, but one species.

The problem was taken up by Odoardo Beccari,[5] who re-

[1] Trees and Shrubs 2: 118. 1911.

[2] See under "Bucaneer-palm," Journal of the New York Botanical Garden : 33–43. 1922.

[3] *Paurotis androsana* O. F. Cook, Mem. Torrey Club **12**: 22. 1902.

[4] See under "Bucaneer-palm," Journal of the New York Botanical Garden : 39. 1922. Mrs. Northrop lost her life at Mt. Riga, New York, near e state lines of Massachusetts and Connecticut, May 6, 1922, when the tomobile in which she was riding was struck by a train.

[5] Odoardo Beccari, born at Florence, Italy, November 19, 1843, was edu- ted at Lucca, Pisa, and Bologna. In early life, from 1865 to 1878, he ent much time in botanical exploration, visiting for that purpose Abyssinia,

surrected the unpublished generic name *Acoelorraphe*[1] and published both the Cuban and the Floridan species under it[2]. Beccari records a slightly different version of the discovery of the flowers and the fruits in Florida. He says, the flowers were collected thirty miles southeast of Lake Trafford near the source of the Chokoloskee River in May, 1898, by R. G. Corbitt and that the fruits were collected in Royal Palm Hammock in December 1898 by R. B. Storter. The original description of *Serenoa arborescens* and the plate subsequently printed in the Silva[3] are, in themselves, sufficient to exclude the plant from the genus *Serenoa*, and had the author of *Serenoa arborescens* seen the palm growing in its native haunts he surely would not have associated it with that genus.

From the writer's experience with this palm he would consider the case of *Serenoa arborescens* versus *Paurotis Wrightii* an excellent example of indoor-botany versus field-botany.

At any rate, Sargent accepted Beccari's treatment of the genus, at least as far as Florida is concerned, and published a synopsis of the two species there recognized, a description of *Acoelorraphe Wrightii* with a plate[4].

However, he is careful to make it clear that he himself is not responsible for maintaining two species[5], but throws the burden of proof on Beccari who has already attempted to distinguish them.[6]

The writer, within the past few years, has had the good fortune to be able to penetrate into different parts of the area occupied by this palm in the Cape Sable region of Florida.

India, Sumatra, Java, Borneo, Celebes, Amboina, Papua, Australia, and New Zealand. In 1878 he was appointed director of the botanical garden and museum of his native city, but retired within a year or two, as director emeritus, to devote all of his attention to the study of his extensive collections. For many years he was recognized as the foremost student of the palms of the world. He died at Florence, October 25, 1920.—John Hendley Barnhart.

[1] Referred to by Wendland in 1879, but not published.

[2] Webbia **2**: 107 118. 1907.

[3] C. S. Sargent, Silva of North America **14**: *pl. 734*. 1902.

[4] Trees and Shrubs **2**: 117–120. *pl. 151*. 1911.

[5] Trees and Shrubs **2**: 118.

[6] Webbia **2**: 107–118. 1907.

He first encountered it in abundance in the hammocks bordering Cuthbert Lake[1]. En route to that very isolated locality he first saw small specimens of it along some of the arboreous tunnels, which must be traversed to reach the lake; but it was the higher ground about the lake that supported magnificent colonies of this palm. Those in shaded places with tall naked stems of nearly uniform height bore only a brush-like crown of leaves at the top; whereas the colonies in exposed situations had more copiously leafy stems and greater variety in length. These latter colonies thus present beautiful masses or banks of green foliage. The localities mentioned are within the influence of the tides of the Bay of Florida and the waters are strictly saline.

The day following our introduction to this palm we again encountered it about Coot Bay, which is one of the multitudinous subdivisions of the so-called White Water Bay, which is largely a vast labyrinth of mangrove swamps and channels. It cuts off the Cape Sable region proper, a crescentic area of about one hundred and twenty-five square miles with Coot Bay forming its southeastern extremity and approaches to within about two miles of the Bay of Florida. Coot Bay, however receives its tidal influence not from the nearby Bay of Florida, but from the Gulf of Mexico, whose nearest inlets situated in the southern part of the Ten Thousand Islands, are about twenty miles distant in a direct line. Like the Cuthbert Lake region, the Coot Bay region is strictly saline, except for the varying rainfall which, of course, has little effect on the water supply of the vegetation.

We next encountered this palm in Madeira Hammock, which surrounds Madeira Bay and is situated a little east of the middle of the lower end of the Florida peninsula. Here, at least in a given area, the growth is much more copious than at the two above mentioned localities.

The growth of broad-leaved trees is not continuous along the shore of Madeira Bay; but it is interrupted at several places by prairies that reach to the water's edge. They are southward extensions from the Everglades.

[1] Journal of the New York Botanical Garden **17**: 189–202. 1916. The Cape Sable Region of Florida 1–27. 1919.

At both Cuthbert Lake and Coot Bay the palm is largely hidden in the hammocks; but at Madeira Bay large colonies of it may be seen while crossing the bay, both in the prairies and in the hammock, where the crowns of leaves are often conspicuous above the roof of the hammock.

The stems of the colonies growing in the hammocks seem to be taller than those of the prairies. Perhaps this condition is brought about by the less frequent fires, and thus, in order to get more light, the crowns of necessity push themselves above the shade of the broad-leaved tree-tops. Their stems are very closely set, as well as numerous. The growth is often so dense that one cannot get through the stockade of stems.

On the prairies the colonies are often swept by prairie fires. The first time we visited that locality the plants were in beautiful leafage and the prairie was densely clothed with tall grass. On our second visit the prairie was barren and the colonies of palms comprised blackened poles with stubs of charred petioles sticking out irregularly where the crown of leaves should have been. Of course, after a time, new leaves are developed, the blackened petioles are pushed off and the colonies again assume their normal condition.

Madeira Bay and Coot Bay represent the southern limit of this palm in Florida. It has not yet been found on the Florida Keys. There is, however, a chance of finding it growing on some of the islands between Big Pine Key and Boca Chica Key.

In our next experience with it we approached it from the opposite direction, that is, from the north. On the prairie about ten miles southwest of Royal Palm Hammock, Dade County, this plant appears to be perfectly at home under freshwater conditions instead of salt. It grows just as plentifully and as luxuriantly as at the localities mentioned before.

This fourth region is apparently not many miles distant from either Cuthbert Lake or Madeira Hammock. However, of the four localities it is the one where the palm shows to the best advantage, for the prairies are open and the hammocks are small, at least, relatively so, and scattered too. The isolated colonies and those raising their tops above the hammocks are visible for long distances over the prairies, and when in fruit

In hammock about Madeira Bay, southern end of the Florida peninsula. Within a colony of the saw cabbage palm. In the case of a large colony—several hundred erect stems—one could stand hidden as in a stockade. The palm colony

the elongated spadices with numerous red or purple fruits constitute the most conspicuous element in the landscape.

The visit to the type locality of *Serenoa arborescens* was made for the purpose of determining whether that palm was really distinct from *Paurotis Wrightii* (*Acoelorraphe Wrightii*).

With the plants (*Acoelorraphe arborescens*) of the Cape Romano region fresh in mind, we compared them with those of the Cuthbert Lake-Madeira Hammock region. The writer found that the only character that appeared worth while in Beccari's diagnosis—that is, the lobing of the leaf-blade—failed utterly. The habit of the plants in all the regions is identical.

As a means for future comparison, living specimens were taken from various regions, which really represent the extremes of the geographical range in Florida, and planted in the reservations of Mr. Charles Deering at Buena Vista and at Cutler.

As all the *Paurotis* now known in Florida is referable to a single species, the synonymy would stand thus:

Paurotis Wrightii (Griseb. & Wendl.) Britton and Shafer, N. A. Trees 141. *fig. 107*. 1908.

Copernicia Wrightii Griseb. & Wendl.; Griseb. Cat. Pl. Cub. 220. 1866.
Serenoa arborescens Sargent, Bot. Gaz. **27:** 90. 1989.
Paurotis androsana O. F. Cook, Mem. Torr. Club, **12:** 22. 1902.
Acoelorraphe Wrightii (Griseb. & Wendl.) Wendl.: Beccari, Webbia **2:** 109. 1907.
Acoelorraphe arborescens (Sargent) Beccari, Webbia **2:** 109 and 113. 1907.

Although all our palms have striking gross characters, yet most of them are otherwise neither particularly noteworthy nor exceptionally striking beyond a horizontal or erect stem with a crown of fan-shaped or feather-shaped leaves at the growing end. However, two of our palms have prominent characters all their own. The needle-palm (*Rhapidophyllum Hystrix*) is furnished with myriads of long firm needles con-

stituting an armament which fallen into would inflict uncomfortable, if not serious, consequences.

Although the subject of this paper is armed to the extent of prickles on the petioles, its most striking characteristic is its mode of growth. A single stem becomes a colony which sends up, from a subterranean stem-system, secondary stems (branches), in the case of well-developed plants, in such numbers and so closely placed as to form an impassable stockade.

JOHN K. SMALL

BLACK DUCKS IN NESTING TIME.

Early in April, several pairs of ducks, including the black, mallard and wood duck, began looking over the grounds of the Botanical Garden for suitable nesting sites. A miniature island, some six or eight feet from shore in the water-arum pond, with only a few square feet of surface exposed and well covered with brush, except in the middle, seemed to be the most attractive spot to be found by both black ducks and mallards. The black ducks were first on the premises to begin their home-building and by April 19th a bird had her nest completed and was quietly setting, while her mate could usually be seen leisurely floating on the water near by.

Some days later a pair of mallards appeared and the female began building a nest close to that of the black duck's but at a trifle lower elevation. She evidently was not well satisfied with such crowded quarters or possibly the ground was a bit too low or wet, for after placing a few sticks and leaves she soon flew away to be seen no more about the place. Not so with her partner, however. He apparently liked the situation and was not inclined to give it up so readily, loitering about for some days. By April 24th he had driven the black drake away and began closely guarding the nest of the black duck, often squatting on the island within a foot or two of the setting bird or swimming close by. At first the black duck resented this intrusion of the mallard into her domestic affairs, pecking at him when he approached too near, but she soon seemed to become reconciled to the situation and a little later the mallard proved a quite valiant

defender of her home. Everything seemed to go on quietly until May 14th, when some careless and lawless individual brought a hunting dog into the park, allowing the animal to rove at will. The dog was not long in discovering the mallard and lost no time in plunging into the pond after the bird. However he seems to have more than met his match in the water, for the wise old mallard just kept a little ahead of his pursuer, flying a few yards when too closely pursued and leading the dog back and forth, but always away from the nest, and keeping these tactics up for ten or fifteen minutes before the dog could be called off by his master or driven away by interested spectators. After this life and death struggle, affairs again resumed their previous quietness, the setting bird rarely leaving her nest and the mallard almost always in sight only a few feet away.

As the time for hatching approached the nesting bird remained quite motionless for hours at a time, her head bent over and resting on her back, the bill more or less hidden among the feathers and eyes closed, seeming to pay no attention to observers quite near by. On the morning of May 18th, just a month from the time the bird was first observed setting, at least six of the nine eggs constituting the set were hatched and by noon certainly all the birds were out. Early in the morning as many as there young could be seen at a time peeping out from the breast feathers of the mother and gazing at the world about them. Soon one of these, more venturesome than the others, came out fully into view and began walking around the edge of the nest, when, apparently by accident it fell clumsily over the rim to the ground below, only a matter of six or eight inches, to be immediately followed by two others, not accidentally this time, however, and thus all three began their wanderings into space from the confining walls of a few hours before. The young birds looked about, began inspecting and picking at everything within reach and soon two were at the water's edge, which they looked at, touched with their bills and soon after scrambled readily back onto the nest again, the mother meantime making no noise, but being very much alert to everything going on. Soon matters quieted down, the young all taking a rest after their first experience in the open. A few hours after and somewhere near noon, wholly unobserved so far as the writer knows, the

duck left the nest, led all her young into the water and across a narrow strip of land to the lily-pond, where she and her brood were seen for the last time in the Botanical Garden.

Possibly the black ducks were from the Zoological Park and the old bird went down the Bronx River with her brood to well known feeding grounds. The mallard in the case, although not seen just before or while the young were hatching, rather singularly reappeared a day after the nest was deserted by the family and could be seen sitting on or swimming near the nest for several days following. Just what his feelings were it is hard to imagine. Was he resting up after so much guard-duty, mourning over a deserted home or only taking a siesta amid quiet surroundings?

—R. S. W.

THE IRIS SOCIETY EXHIBITION

The third annual exhibition of the American Iris Society was held at the Garden May 27 and 28, in cooperation with the New York Botanical Garden and the Horticultural Society of New York. The unusally early spring necessitated the advance of the date by one week, and even then the irises of New Jersey and Pennsylvania were beyond their prime. Nevertheless, there was an excellent display which attracted large numbers of interested visitors. The annual meeting of the Iris Society was held May 27 at the mansion, following a lunch for the members. Chief interest at the meeting was centered on the test garden, which was later inspected by the Society. This large and growing collection, established by the Society and the Garden jointly in 1920, now contains approximately 800 varieties of tall bearded iris, and most of them were in full bloom. Practically all the old standard varieties are represented in the collection, as well as many of the newer introductions. It is the intention of the Iris Society to make the collection as complete as possible, so that it will serve as a living catalog for the guidance of interested persons.

Blooming just after the tulips and before the roses, the irises now form one of the leading floral features of the Garden and

add greatly to the attractiveness of the horticultural grounds. The new peony collection has been established near them, and the two will soon supplement each other.

—H. A. G.

THE FRANCIS LYNDE STETSON FUND

The will of the late Mr. Francis Lynde Stetson, who was a member of the Board of Managers of the New York Botanical Garden from 1908 until his death in 1920, and a Vice-President since 1914, provides a legacy of $25,000 for the purposes of the Garden, which was paid over by his executors toward the close of 1921. The following action was taken by the Managers at their meeting on April 20, 1922:

> RESOLVED: that the bequest of $25,000, received from the estate of the late Mr. Francis Lynde Stetson, be and hereby is designated the FRANCIS LYNDE STETSON FUND, and that its income be applied to such purposes as may be voted by the Board of Managers from time to time.

An appropriation of $1,000 from the income of the Francis Lynde Stetson Fund for the year 1922 was made for the purchase of books.

CONFERENCE NOTES FOR APRIL.

The April Conference of the Scientific Staff and Registered students of the Garden was held in the museum building, Wednesday, April 5th.

Dr. H. A. Gleason spoke on "The Relation of Species to Area." He pointed out that the natural tendency of plants is to migrate in all directions as far as the environment permits, and that this process ultimately produces a uniform mixture of species in the plant association. Each quadrat in such an association contains about the same number of species, the number being

regulated by the richness of the flora, the size of the plants, and the size of the quadrat. If quadrats of larger size are examined, the number of species is found to be larger, but the increase is not directly proportional to the increase of area. The more uniform the flora, the slower will be this rate of increase in the larger quadrats.

If the relation of species and area is plotted, using areas as abscissas and species as ordinates, the result is a curve, somewhat resembling a hyperbola in shape. But if, instead of the area, the logarithm of the area is used as the abscissa, the result becomes practically a straight line, by the extension of which the number of species in larger areas may be estimated directly.

A full discussion of the relation of species and area will appear in an early number of *Ecology*.

In a brief discussion of some of the taxonomic problems in monographing the Caprifoliaceae, Mr. C. C. Glover pointed out the lack of characteristics for distinguishing many of the species which have been dsecribed, and cited *Symporicarpos rotundifolius*, *S. vaccinioides*, *S. oreophilus*, *S. tetonensis*, *S. utahensis*, *Viburnum cassianoides* and *V. nudum* as examples.

In contrast to these doubtful species he showed how perfectly some of the other closely related species could be separated, and gave as an illustration the three maple-leaved viburnums wherein *V. acerifolium* has stellate hair clusters; *V. pauciflorum* has long coarse irregularly bent cotton-like hairs; and *V. opulus* either has simple short straight hairs or is entirely glabrous.

A. B. STOUT
Secretary of the Conference

NOTES NEWS AND COMMENTS

A joint meeting of the Torrey Botanical Club, Wild Flower Preservation Society of America, and New York Bird and Tree Club was held at the Garden on Wednesday, April twenty-sixth. The day was exceptionally fine and about one hundred people were present. In the forenoon, excursions were made through the grounds to study birds, trees, and flowers under the direction

of Dr. Fisher, Dr. Southwick, Mr. Wilson, and others. Lunch was eaten in the mansion at one o'clock, after which Dr. Wherry gave an illustrated lecture on "Woodland Wild Flowers," followed by Dr. Denslow and Mr. Lownes on "Our Local Orchids." Specimens and illustrations of orchids and other wild flowers were on exhibit.

The Inkowa Club of New York City, established for the promotion of out-of-door life, held a field-day at the Garden on April 23, visiting many parts of the grounds and the buildings under the guidance of a member of the Garden staff. Beginning at the court of conservatory range 1, where the early tulips were in splendid flower, they first inspected the tropical houses, conifer collection, herbaceous garden, rock garden, hemlock grove, and the mansion, where they had their luncheon. In the afternoon, they visited Long Lake, the propagating houses, conservatory range 2, the Japanese cherry orchard, the meadows of the Bronx River, the shrub collection, and the museum building, where they examined the collections and attended a lecture by Miss Hilda Loines on "English Flower Gardens." Much interest was shown by the members of the Club in the geology and history of the rocks, trees, and other natural features of the Garden reservation. Miss Angelique Rivollier, Activities Director, was in charge of the excursion.

Volume 6, part 1, of North American Flora consists of a monograph of the genus *Phyllosticta* by Fred J. Seaver. The work is largely a compilation of the species described and reported for North America, *i. e.* no attempt has been made to culture out the species in order to determine their life histories, although the gross morphology has been studied as carefully as the available material will permit. Wherever the perfect stage is known it has been indicated in a note supplementary to the descriptions. In order to comply with the form, a key has been arranged. On account of the difficulty, however, of constructing a satisfactory key for such a large genus in which the specific differences are so slight, the general rule for North American Flora has been modified and a host index supplied for the genus. An attempt has been made to correct host determinations where

material is adequate but unfortunately many of the specimens are so fragmentary that it has been necessary to accept the host determinations made by the collector. The entire work consists of 84 pages of text and was issued early in April.

Perfect fruiting specimens of *Buxbaumia aphylla* L., a rather rare and very interesting moss with large, peculiar capsules, were found by Dr. Murrill at Yama Farms, in the southern Catskills, on May 9, growing in sandy soil beside a path on a rocky hillside in thin, oak-chestnut woods. This species was found many years ago on decayed wood in the hemlock grove by Mr. Williams, who published a brief article on the three American species of the genus in the first volume of the *Journal*. The soil at the Yama Farms locality was carefully examined under a lens and no decayed wood was found in or near it.

Over 300 biology pupils from Evander Childs High School visited the Garden on May 22 and were shown through the conservatories and around the grounds by several members of the Garden staff. After studying a number of the trees on the lawns, they assembled in the large lecture room for a talk on forestry, given by Mr. George T. Hastings. At the close of the lecture some time was devoted to a study of the collections in the economic museum.

The Burroughs Nature Club of Newark, New Jersey, visited the Garden on the afternoon of May 20 to see the temperate and tropical collections of living ferns. Thirty or more members were present, including the newly elected president and vice-president. The excursion began at the rock garden and ended at conservatory range 2; with brief stops in the iris garden, hemlock grove, mansion, and deciduous arboretum.

Mr. Oakes Ames published on April 5th, 1922, the seventh volume of his valued papers on orchids, and has continued his liberality to the Garden by sending a copy for our library, having previously sent the proceeding six volumes as published; the seventh contains eleven papers, covering a wide range of

studies of both American and Old World orchids. Several species new to science are described from specimens sent him from our herbarium.

President J. A. Blaisdell of Pomona College, Claremont, California was a recent visitor at the Garden. He is interested in securing cooperation on some of the citrus problems of Southern California, Pomona College being located in the citrus belt.

Professor H. M. Fitzpatrick of Cornell University spent several days at the Garden in May continuing his researches on certain groups of Ascomycetous fungi.

Meteorology for April: The total precipitation for the month was 2.54 inches. The maximum temperatures recorded for each week were as follows: 75° on the 8th, *88° on the 10th*, 72° on the 18th and 80° on the 26th. The minimum temperatures were: *31° on the 3rd*, 39° on the 16th, 38° on the 22nd and 32° on the 29th. Killing frosts occured in the first and last weeks of the month.

A group of botanical students from Hunter College came to the Garden on April 27 to examine the orchid collection and to hear a talk by Dr. Gleason on this large and interesting family of plants.

About seventy-five biological students from the Academy of Mount St. Ursula spent the afternoon at the Garden on April twenty-eight. They were shown through portions of the grounds and buildings by Mr. Wilson and other members of the Garden staff.

Miss Helen Purdy, who is now assisting Dr. Murrill with the collections of the higher fungi, gave a brief account of her recent research in Copenhagen at an informal meeting of the Barnard Botanical Club, held at the home of Mrs. Boyle, Saturday, May 6th.

This spring Dr. Stout is conducting important breeding work with about twenty species of the genus *Lilium*.

ACCESSIONS

PLANTS AND SEEDS

3 plants of *Citrus* for conservatories (given by Mrs. Grimes).
1 plant of *Codiaeum* (given by Mr. Wm. H. Becker).
3 plants of crested begonia (by exchange with Mr. W. A. Manda).
10 plants for conservatories (by exchange with U. S. Dept. of Agric).
2 plants for nurseries (by exchange with College of Agric., Ithaca, N. Y.).
2 plants of *Castalia* "Attraction" (by exchange with Missouri Bot. Gard.).
1 plant for conservatories (by exchange with U. S. Nat. Museum through Dr. J. N. Rose).
1 plant of *Sedum* for conservatories (by exchange with Prof. Thorne).
4 plants of *Opuntia* from Florida (collected by Dr. J. K. Small).
7 cactus plants (by exchange with Dept. of Agric. of Trinidad).
32 plants of *Iris* from Florida (collected by Dr. J. K. Small).
1 packet of seed (given by Mr. J. Hartling).
1 packet of seed (given by Prof. Glover).
1 packet of *Bactris utilis* seed (by exchange with U. S. Dept. Agric.).
44 packets of seed (by exchange with Central Experiment Station of Canada).
1 packet of seed (by exchange with U. S. Dept. Agric.).
1 packet of seed (by exchange with College De La Salle, Habana).
91 packets of seed (purchased).
2 plants for conservatories (given by Mr. Edward W. Doherty).
3 plants of *Oncidium* for conservatories (given by Miss Harriet J. Coxe).
537 plants for iris garden (given by American Iris Society).
2 plants for iris garden (given by Mr. John C. Wister).
1 plant of *Tinantia* for conservatories (given by Miss Lula Pace).
1 plant of *Arbutus* (given by Mrs. Jean Kerr).
5 plants for iris garden (given by Mr. C. N. Wettengel).
2 plants for iris garden (given by Mr. J. M. Shull).
35 plants for conservatories (given by Mr. Fisher).
33 plants from Porto Rico (collected by Dr. N. L. Britton).
1 plant of *Opuntia* from Florida (collected by Dr. J. K. Small).
17 plants from Brazil (collected by Mr. P. H. Rolf).
25 plants of *Areca lutescens* (given by Mr. E. Murray Brunner through Dr. N. L. Britton).
7 plants for arboretum (by exchange with U. S. Dept. of Agric.).
1 plant for conservatories (by exchange with U. S. Nat. Museum through Mr. W. R. Maxon).
15 plants of *Abutilon* (by exchange with Botanic Garden, Cambridge, England).
1 plant of Bougainvillea (by exchange with Brooklyn Botanic Garden).
95 plants for conservatories (by exchange with Storrs & Harrison Co.).
4 plants for conservatories (by exchamge with Dr. E. J. Palmer).
9 plants for conservatories (by exchange with Dr. E. T. Wherry).

5 plants for conservatories (by exchange with U. S. Nat. Museum through Dr. J. N. Rose).
6 plants for decorative planting (purchased).
11 plants for collections (purchased).
1 plant (raised from seed).
1 packet of seed (given by Mrs. N. L. Britton).
9 packets of seed (by exchange with Botanic Garden, Cambridge, England).
43 packets of seed (by exchange with Botanic Garden, Glasnevin, Dublin, Ireland).
58 packets of seed (by exchange with Botanic Garden, Bonn, Germany).
60 packets of seed (by exchange with Botanic Garden, Cernauti, Transylvania).
19 packets of seed (by exchange with Botanic Garden, Cluj, Roumania).
26 packets of seed (by exchange with Botanic Garden, Groningue, Holland).

LIBRARY, FROM JAN. 1–APRIL 30

Archivos do Museu Nacional do Rio de Janeiro. Vols. 1–3, 10. Rio de Janeiro, 1876–99 (given by the Museu Nacional de Rio de Janeiro).

CANNON, WILLIAM AUSTIN. *Plant habits and habitates in the arid portions of South Australia.* Washington, 1921 (given by the Carnegie Institution of Washington).

Catalogue of the library of the Massachusetts Horticultural Society. Cambridge, 1918.

CLARK, GEORGE HAROLD, & MALTE, MALTE OSCAR. *Fodder and pasture plants.* Ottawa, 1913 (given by Dr. P. A. Rydberg).

CLEMENTS, FREDERIC EDWARD. *Aeration and air-content.* Washington, 1921. (given by the Carnegie Institution of Washington).

EVELYN, JOHN. *The French gardiner.* Ed. 3. London, 1672.

GRABAU, AMADEUS WILLIAM. *A textbook of geology.* 2 vols. Boston, C 1920.

HALL, HARVEY MONROE, & LONG, FRANCES LOUISE. *Rubber-content of North American Plants.* Washington, 1921 (given by the Carnegie Institution of Washington).

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HOTTES, ALFRED CARL. *Practical plant propagation.* Ed. 2. New York, 1922.

Index Kewensis. Supplementum quintum. Oxonii, 1921.

Journal of the Marine Biological Association of the United Kingdom. Vols. 7–12. Plymouth, 1904–21 (by exchange).

KROK, THORGNY OSSIAN BOLIVAR NAPOLEON, & ALMQUIST, SIGFRID OSKAR IMMANUEL. *Svensk flora for skolor.* Vol. 2. *Kryptomgamer.* Ed. 3. Stockholm, 1907 (given by Dr. W. A. Murrill).

MCILVAINE, CHARLES, & MACADAM, ROBERT K. *One thousand American fungi.* Ed. 3. Indianapolis, [1911]

OLIVER, GEORGE WATSON & HOTTES, ALFRED CARL. *Plant culture.* Ed. 4. New York, 1921.

PASCHER, ADOLF A. *Die Süsswasser-Flora Deutschlands, Osterreichs und der Schweiz, ed.* Heft 7. *Chlorophyceae* 4. Jena, 1921.

SARGENT, CHARLES SPRAGUE. *Manual of the trees of North American.* Ed. 2. Boston, 1922.

SMYTHE, WILLIAM E. *City homes on country lanes.* New York, 1921 (given by Mr. Charles Lathrop Pack).

STOUT, ARLOW BURDETTE. *Gardening.* Yonkers-on-Hudson, 1922 (given by the author).

STOUT, HENRIETTA MARIA (SCHROEDER). *The amateur's book of the dahlia.* Garden City, 1922.

WERNHAM, HERBERT FULLER. *A monograph of the genus Sabicea.* London, 1914.

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Vol. 3, part 1, 1910. Nectriaceae—Fimetariaceae.

Vol. 7, part 1, 1906; part 2, 1907, part 3, 1912; part 4, 1920; part 5, 1920; part 6, 1921. Ustilaginaceae—Aecidiaceae (pars). (Parts 1 and 2 no longer sold separately.)

Vol. 9 (now complete), parts 1–7, 1907–1916. Polyporaceae—Agaricaceae (pars). (Parts 1–3 no longer sold separately.)

Vol. 10, part 1, 1914; parts 2 and 3, 1917. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916; part 2, 1917; part 3, 1918. Chenopodiaceae—Allioniaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913; part 6, 1918. Podostemonaceae—Rosaceae.

Vol. 24, part 1, 1919; part 2, 1920. Fabaceae (pars.)

Vol. 25, part 1, 1907; part 2, 1920; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 32, part 1, 1918. Rubiaceae (pars).

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.50 per volume. To others, $3.00. [Not offered in exchange.]

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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIII July, 1922 No. 271

JOURNAL

OF

The New York Botanical Garden

EDITOR

R. S. WILLIAMS

Administrative Assistant

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA

INTELLIGENCER PRINTING COMPANY

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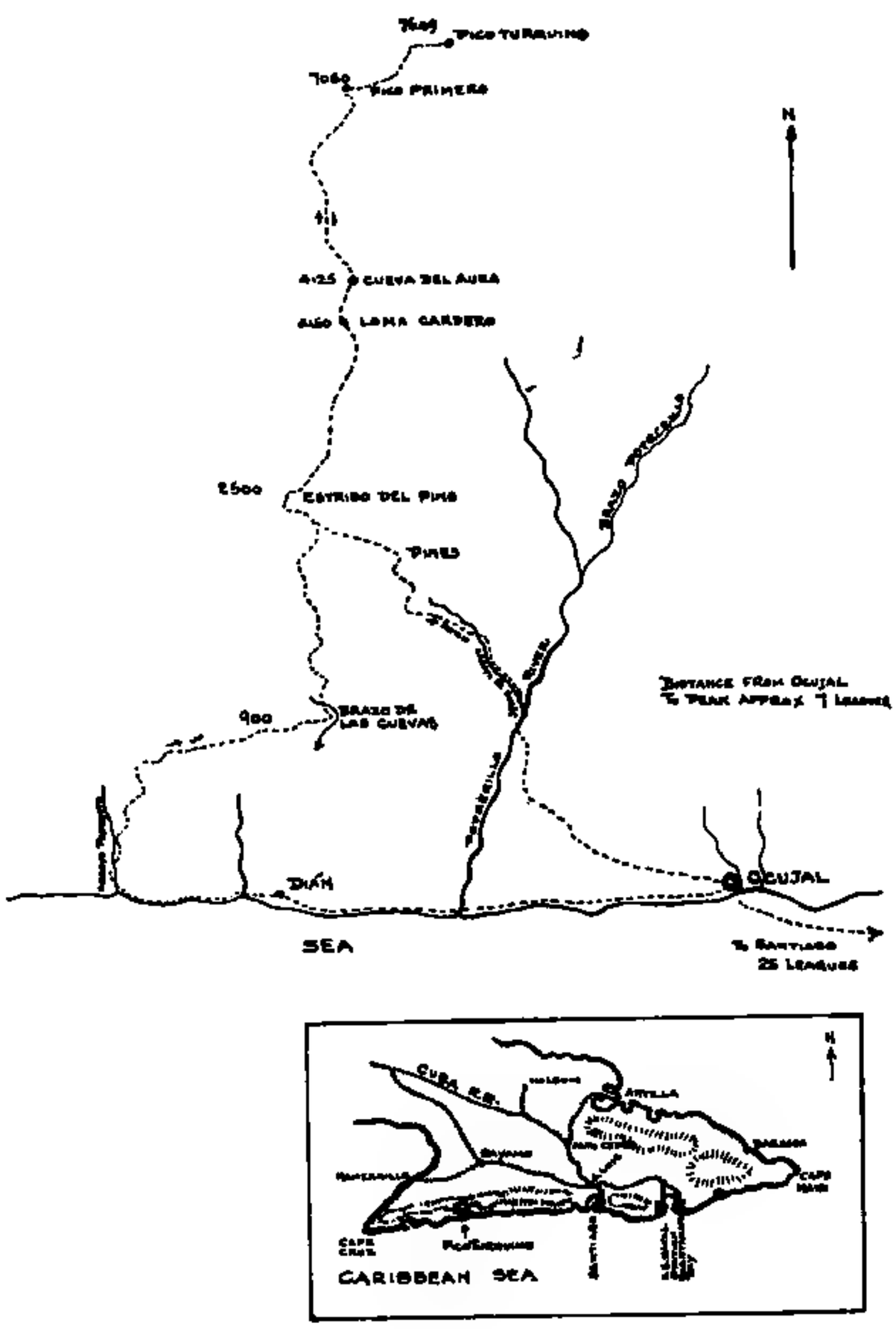
NARRATIVE OF AN ASCENT OF PICO TURQUINO, CUBA

On the night of April 6th, I left the wharf at the ice factory at Santiago for Ocujal on a fishing launch, a run of 25 Cuban leagues, some sixty odd miles. We arrived in front of Ocujal beach at 8:45 a. m. on the 7th, having had good weather and a very calm sea. This beach is a slight semicircular indentation in the coast line, and is composed of boulders and pebbles with no sand. The formation of these is principally a kind of diorite, a mixture of quartz and feldspar with no mica, serpentine, and a hard black stone like basalt. The surf breaks constantly on this beach, and only in calm weather can a landing be made in a little skiff which the fishermen keep anchored out beyond the line of breakers. As on all rocky beaches when each wave recedes there is a grinding noise. All of the stones are rounded and polished by the action of the waves. A landing was made without difficulty although the skiff was swamped going back to the launch.

Ocujal is an ordinary coast settlement, and is made up of four houses of the usual native construction. I noticed, however, that the mud walls instead of being wattled and plastered are formed of sticks placed four or five inches apart with grass worked in between and all this plastered over. The natives claim that this kind of wall lasts longer than the usual wattled and plastered one. The natives raise hogs, a few cattle, and all have their "estancias," or gardens. Some of them go outside to work at Ensenada de Mora, a sugar mill near Cape Cruz.

The coast is fringed with a growth of "uvero" or sea-grape (*Cocolobis unifera* Jacq.), and back of this is a savana country with clumps of brush and trees, especially in the ravines. Near the houses are mango, maranon (cashew) and mamoncillo trees. The birds that I noticed along the coast were parrakeets, crows,



Lower map showing eastern end of Cuba and position of Pico Turquino In upper map the trail to Pico Turquino and return is indicated by dotted lines.

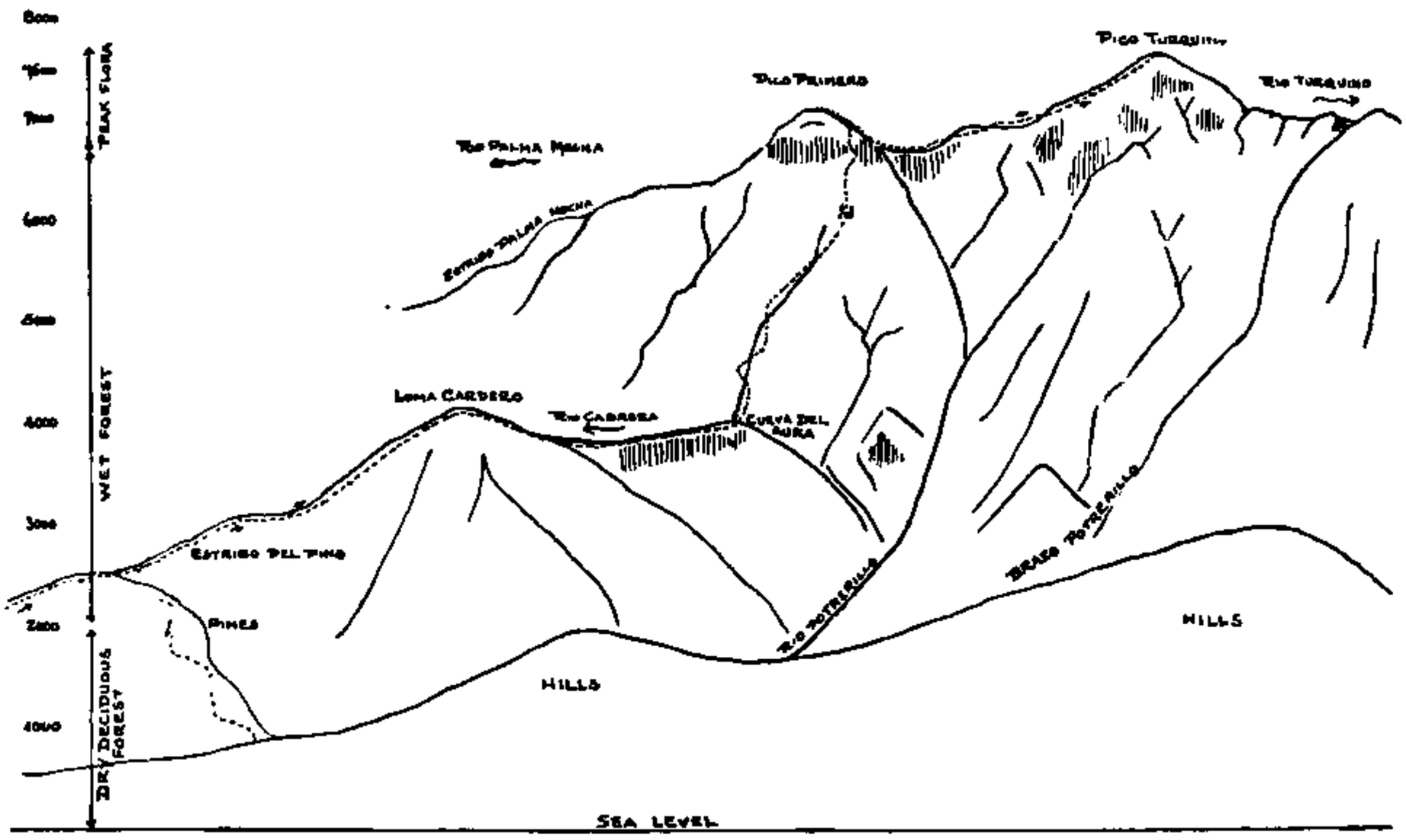
"zorzales" (a slate colored thrush), "negritos" (a black finch), grass-quits, white-winged dove, blue pigeons, "camás" (a large dove), "tocororos" (Cuban trogon), woodpeckers, nighthawks, a bittern, and "guacaicos" (a large raincrow). I saw no regular parrots, but was told that at Bayamito to the east there were numbers of them.

At Ocujal I made arrangements to stay at the house of Alberto Peña y Alarcón, who has lived there for about ten years. His house, about three hundred yards back from the beach, is of the regular Cuban country type, with one room separated by mud walls, and the other open where the family eat and sit. The thatch is of "guano" or royal palm leaves. The kitchen is separate, and there is another house with "yarey" thatch and "yagua" walls in which I slept. The whole is enclosed by a fence like a stockade of heavy posts of "guayo" (*Citharexylum sp.*) set into the ground and sharpened on top.

Alberto had not been to the top of Turquino so we had to wait until a relative of his, Juan Diaz, came over from La Dián, a two house settlement, less than a league to the westward on the other side of the Potrerillo river. On the morning of the 8th Alberto and I rode down to Turquino beach to the east where the Turquino river empties into the sea. This is a much longer beach than Ocujal, and on it is considerable wreckage from the "Colon," a Spanish warship sunk during the Spanish-American War. In the savanas along the lower part of the Turquino river there is a great deal of "súchere cimarrón." apparently a *Rauwolfia* or *Plumeria*, resembling "lirio de costa" except with finer leaves and petals. The bushes are about ten or twelve feet in height and were covered with masses of white blossom. Here we found two men who had come through from the other side of the Sierra Maestra to hunt deer and fish. They were small farmers from Bueycito, a point on the Buey river. They told us that there is a trail up the Turquino river and over the Sierra, along which one could go on foot.

On the afternoon of the 8th, we made our preparations to leave early the next morning. I took machete and revolver, and in my pack kodak and films, oilcloth and a blanket, cigars, cigarettes, matches, aneroid barometer, compass, thermometer, notebook and pencil. Alberto made up a pack of supplies, which consisted of bread and "galletas," a kind of hard tack biscuit made by the bakeries here, three tins of condensed milk, ground coffee, sugar, four tins of sardines, two of peaches, a piece of "salchichon," a sort of sausage, two dozen hardboiled eggs, a tin can for boiling water, and an enamelled cup. Juan carried a five gallon gasoline tin for water.

Sunday, April 9th, 1922. Alberto and I left his house at Ocujal at 5:10 A. M. going by La Dián for Juan the guide. From here we continued down the coast to a point where a dry ravine, Arroyo Papayito, comes down, passing two large granite outcrops on the coast. Here we turned north, entering the woods from the beach, and worked up a steep slope with very difficult footing as the soil was largely sand made up of decomposed granite. At an elevation of about 700 ft. we reached the top of a ridge and continued up this ridge to an elevation of about 1000 ft. where we found water at Brazo de las Cuevas,



Profile map of mountains showing relative height of various points and trail.

at 7:30 A. M. We ate breakfast in a ravine covered with a growth of wet forest. At 7:55 A. M. we left Brazo de las Cuevas, climbing another hill which lies in a bend of the brook, and on up to an old camp where a mining claim had been surveyed. At this point I saw what the guide told me were "platanos cimarrones" or wild plantains. There was a group of them in the ravine, but without flowers or fruit, and I was told that they did not bear. The leaves were very perfect and were not split down to the center stem by the wind. They were also of a brighter green and appeared to be stiffer than the ordinary

plantains. Is this a wild plantain or a cultivated plantain that has degenerated?

After crossing the deep ravine, with a beautiful little stream of clear cold water, we started up a very steep slope of green woods, where many of the trees were the same as in the drier coast woods. We saw one cedar about fifteen feet in circumference, but no other cedars nor any mahogany. Near the top of this slope we came to another ridge, and in a ravine the first tree ferns and "manaca" palms. The "manaca" palms resemble the royal palms, but are much smaller and with finer more drooping leaves. This point at about 2000 ft. above sea-level marked the beginning of the wet forest, which growth continued until almost to the top of the first peak. At this point the trees of the coast had disappeared. We continued up this slope among some very beautiful clumps of "manaca" palms to a ridge known as Estribo del Pino, where there was a fallen dead pine. It was too dark in the forest to attempt to take any pictures with the kodak. Here Alberto and I waited on Juan to go down to the head of the ravine to bring up water. On top of the ridge the woods were very wet from the clouds that constantly sweep over the ridges. We pushed along this ridge which is a spur of Loma Cardero (Cardero Hill). The soil here is composed of decayed vegetation so deep that one sank to his shoetops. The footing was very slippery due to many tree roots and to the dampness. Among the roots of the trees we noticed a number of burrows which we supposed to be of the solenedon. We ate lunch on this slope.

At 1:10 P. M. we arrived at the peak of Loma Cardero, about 4,150 ft. Here the woods were the wettest and consequently at this point the orchids and other epiphytes have reached their greatest development. Every tree trunk and stone is covered with a heavy growth of bromeliads, ferns, orchids and mosses, although I believe that there are more different kinds of mosses on the main peak than here. This would be an ideal spot for studying the flora of the wet woods, as it is here that there is the greatest profusion of epiphytes.

After passing over the top of Loma Cardero, which is fairly level just on top, we went down the north slope, which was a relief after so much climbing, to the ridge which connects it

with the first peak. This ridge is very narrow and is capped by hard blocks of limestone, forming a precipice to the east. To the west the slope is very steep but is heavily forested. We continued along this ridge, which was rather difficult, due to many windfalls, and hugh stones, over most of which we had to climb, to a point near the beginning of the first peak. Here we found a sort of cave formed by a large slab of stone mounted on two others, and at this place we stopped for our first night, at 2:10 P. M. This place is called Cueva del Aura, or Buzzard's Cave, and was so named by the Reineke Expedition in 1918, as they found a young buzzard in a nest in the cave. We saw no signs of a buzzard's nest, but a wild hog had had her young there, one of which had died after having grown to some size. The bracken was rooted up and large stones had been moved around by a herd of wild hogs which had worked through there just a day or two before. We noticed several places where they had dug out the tubers of the "ñame cimarròn," wild yam (*Dioscorea*). In this cave we found four water cans left by the previous expeditions, and as our can was leaking badly, Alberto and Juan each took one, and went down to the headwaters of the Cabrera river, some 1000 ft. below on the western slope of the ridge.

La Cueva del Aura is slightly lower than Loma Cardero, and the ridge here is very narrow. At 2:10 P M. when we arrived the thermometer registered 70°; at 3:00 P. M. 66°; at 4:00 P. M. 65° at which point it continued until we went to bed. At 5:00 A. M. the following day, it registered 61°. All afternoon clouds drifted across this ridge, and it was impossible to see out. At about four o'clock in the afternoon the mist began to condense, and fall in large drops, like the first scattering drops of a summer rain, which continued until the land breeze from the north sprang up, blowing the clouds out to sea at about 8:00 P. M. It then cleared up and from a large rock at the edge of the cliff one could see the valley of the Portrerillo river below in the moonlight. At this altitude we saw the last lizard. In the ravines below many "ruiseñores" or Cuban nightingales (solitaire in Jamaica and siffleur montagone in Dominica) were singing. It is impossible to describe their song, but it is the sweetest song of any bird that I ever heard, and seems to fill

the woods like the notes of an organ. At Cueva del Aura we saw no other birds save what seemed to be a pair of warblers, and some "mayitos."

Monday, April 10, we left the Cuvea del Aura at 6:00 A. M., and a ten minutes walk along the ridge brought us to the slope of the first peak. Here we found a tangle of tree ferns, and "tivisi" (a jointed climbing grass, well rooted, and as stiff as wire when firmly fixed to the bushes above) of two sorts, the smooth variety that grows at lower levels, and another called by the natives "raspiente" (rasping) with small thorns which lacerate one's hands badly. There was no large timber on this slope and the only tree that I could recognize was a kind of tecoma with leaves rounded at the tips. This was in bloom and the flower was apparently the same as that of the common "roble" (*Tecoma* or *Tabebuia pentaphylla*). Everything was covered with a species of very fine yellow-green moss. There were many humming-birds which seemed to know no fear of man as they would fly right by one, and even perch on twigs almost where they could be touched. The winds seem to have affected the vegetation greatly here for there were many windfalls, and the trees were stunted, even more so than on the main peak. The soil is largely vegetable mould on a foundation of shale, which made footing very hard and going was bad. There were also many outcrops of loose shaly rock. About the middle of this slope I found an emerald green shell which I have never observed anywhere else. It was very small, measuring not more than a quarter of an inch.

On the east and south faces of the first peak there are cliffs, so we had to work our way in between them, making this the steepest and worst part of the climb. At this point I saw pennyroyal, which I had never before seen in Cuba. The top of the first peak is covered with a dense growth of low shrubs, the principal one of which is apparently a kind of heath (*Leucothoe?*) and "magueyes" (*Agave*) which seemed to attain the same development as on the coast, also a "tivisi" the leaves of which terminate in thorns. This peak is of very hard conglomerate, which has been subjected to a much greater heat and pressure than the conglomerate out-crops on the coast near Santiago, and rests on a stratum of hard limestone. The altitude of the

first peak is 7,050 ft. This peak is rocky and wind-swept, the growth on the southern point only attaining a height of about two or three feet.

The first peak is connected with the main peak (Pico Turquino) by a narrow ridge along which is a trail well beaten out by wild hogs. This ridge might be compared to the top of a wall of great blocks of limestone, and it is from this point that a view can be had of the great valley between the first peak and the Sierra Maestra, the whole Cordillera of the Maestra, and the drainage of the north, including that of the Nauga and Yara rivers. Early in the morning when it was clearest we could distinguish from this point the smoke of the train somewhere near Yara. To the south one can see the basin of the Potrerillo river, the coast, and far out at sea. Due to the haze we could distinguish no horizon. On a very clear day without doubt the Blue Mountains of Jamaica could be seen. After about 8:00 A. M. when the sea breeze springs up everything is shut off by clouds so that one sees only a sea of clouds with the peaks like islands. As we were going along this ridge we heard a number of airplanes below us, en route from Guantanamo Bay, the U. S. Naval Station, to Manzanillo where the fleet go for maneuvers. We could not see them as they were flying below the clouds and we were above, but it seemed strange to hear them so far below us.

After crossing along this ridge, the ascent of the main peak begins, up through a low forest of tree ferns, a subspecies of "cuya" or "carolina" (*Dipholis*) and several other low trees which I could not identify. One in particular makes a seed about the size of the kernel of a peanut, upon which apparently the hogs feed, as the whole slope of the main peak had been plowed up by them. The soil appears rich, and is of a light brown color with a great deal of decayed vegetation. On this slope I found a clump of pink begonias. The ascent from here is very easy. The top which is level and of about an acre in extent, is marked by two boulders, and from a bottle we took a paper left by the previous expedition in 1918, which I brought down to the Museum in Santiago. We left a paper in a bottle, well wrapped in lead foil from a kodak film, and the bottle corked and carefully sealed with beeswax. Right at the top

we found blackberry briers, with pink blossoms and fruit just beginning to turn red. The woods are low, about 12 or 15 ft. high, and all of the trees are gnarled and twisted. Small saplings have bark like old trees, which would indicate a slow growth. On top there are very few orchids, but the development of mosses is greater than on the lower levels in the wet woods. I collected all of the specimens that I could conveniently carry, and shall try to have them identified. I only recognized the "carolina" mentioned above, a different mistletoe from that of the lower country, blackberries, club moss, three varieties of what I suppose to be kinds of heath, and the tree ferns. Even the tree ferns are not as tall as in the wet woods below, but are more thickened in the trunk. Of animal life on top, I saw no snakes or lizards, but saw one land shell, an earthworm, a kind of weevil, a pair of "zorales" which roosted that night near us, what we thought to be a "mariposa" as we saw it flying through the brush (a brilliantly colored small bird caged here a great deal), and a number of large black flies buzzing around which had apparently been attracted by the hogs.

We arrived at the top of the main peak at 2:15 P. M. Monday, April 10, 1922. Thermometer 66°. It continued to drop until at 3:30 A. M. it registered 51°, the lowest temperature that we experienced. Water boiled at slightly under 198° which would indicate an altitude of 7,649 ft. (197½° 7,659 ft.). The barometer was not a very good one so that I used the boiling point of water to determine the altitude, and then corrected my readings for the points below. The altitude as determined by the expedition in 1918 was 2,325 meters, 7,626 ft.

There is very little stone on top, only some loose rocks which appear to be a kind of gneiss. I broke a chip off one and brought it down with me. Without doubt it is Archean, and shows unmistakable signs of having been fused.

During the afternoon it was impossible to see out as everything was under the clouds. One expedition there has cleared a space on top so that by climbing a dead tree one can look out. However, at night the land breeze swept the clouds away, and one could see to the south and east. All night a light southeast breeze blew, but no land breeze on the peak, although below one could hear the wind blowing very hard. It swept the

clouds out to sea where they formed a low bank, being brought back again the next day by the sea breeze. The night was clear and cold, and as it was just the night before full moon we had good moonlight. In the rarified air we felt the cold extremely although we kept a roaring fire all night. During the night no clouds swept over the main peak, and I believe that it is above them most of the time. The soil on top was dry and dusty making a great contrast to that of the wet woods just below.

Neither of the natives had seen a thermometer before, and watched "that needle dive," as they called it, with great interest, and speculated a great deal as to what would happen were the mercury to go clear down into the bulb. None of us felt the altitude particularly, except that the air was much rarer than below, but the dog that we took with us was mountain-sick, and would not eat anything that night on the peak. He lay down just as soon as we reached the top at midday and remained in the same place until the following morning.

Tuesday, April 11, we left the peak at 6:00 A. M. arriving at the Cueva del Aura at 8:30, where we had breakfast, having left food there on the way up the day before. At 9:30 we left the Cueva del Aura, following our trail back to Estribo del Pino. Here, instead of going down the ridge towards the southwest, we turned east in order to see a group of pines on a lower spur of the ridge. Here were forty or fifty pines, the largest being about four feet in diameter at the base, and several others were about three feet. The forest floor was without underbrush, and was covered with a thick layer of pine needles. Just over the brow of the hill there was a small clump of "cupey" (*Clusia rosea*) and a small tree called "dormido" or "janado," which has a leaf similar to that of the "sabicu," but a blossom like "jigüe." These were the beginning of the dry deciduous forest below, the pines seeming to occur just at the lower edge of the wet zone. From the launch as I was returning to Santiago I noticed several strips of pine woods, and as far as I could judge it seems to be the rule that the pines occur between the wet zone and the dry deciduous forest. In some cases they seem to extend higher but only along the center of a ridge. In this group of pines I noticed a vine which seems to be Virginia creeper. I was unable to find any blossom, but took a leaf.

It seems to be just the same as the Virginia creeper of the States, and this is the only place that I have ever noticed it in Cuba. From the pines we continued down through the dry woods, and arrived at Ocujal on the coast at 3:15 P. M., just 9¼ hours after having left the top of the peak.

Our actual walking time in going up, counting out time lost in stops, was 11½ hours, divided into a day and half; our time down, discounting time lost, was 7½ hours of actual walking, in one day. The guide estimates the distance from Ocujal to the top of the main peak, taking into account all of the zigzags of the route, as seven Cuban leagues, or about 18½ miles.

GEORGE CONRAD BUCHER

NOTES ON PLANTS COLLECTED BY MR. BUCHER ON PICO TURQUINO, CUBA

The determinations of the ferns are by Mr. William R. Maxon of the United States National Museum; those of the mosses by Mrs. Britton and Mr. R. S. Williams. All specimens have been placed in the herbarium of the New York Botanical Garden.

1. *Rubus alpinus* Macfad. A mountain blackberry hitherto known in the West Indies from high altitudes in Jamaica. Found by Mr. Bucher on the highest peak of the Turquino.
2. *Trichomanes scandens* L. A filmy fern on Loma Cardero.
3. *Vittaria filifolia* Feé. A narrow-leaved epiphytic fern on Loma Cardero
4. A young epiphytic orchid, Loma Cardero.
5. A fragment of a tree-fern, genus *Cyathea*. Loma Cardero.
6. A low aromatic shrub of the Mint family, collected without flowers on the slope of the first peak, about 6500 ft. altitude.
7. *Peperomia tenella* (Sw.) A. Dietr. Collected in moss at about 6500 ft. altitude on the slope of the first peak. A plant of West Indian mountains.

8. **Walleniella cubana** P. Wilson.[1] A genus and species of the Myrsine Family, new to Science. Wet woods, Loma Cardero.
9. **Xolisma Turquini** Small.[2] A low shrub of the Heath Family, the principal growth on the first peak, about 7000 ft. altitude.
10. *Lycopodium pithyoides* Schl. & Cham. A club-moss growing from Loma Cardero to the summit, 4000 to 7600 ft. Previously collected by S. H. Hamilton in 1912 at 5875 ft.;

[1] **WALLENIELLA** P. Wilson, gen. nov.

Shrubs with alternate leaves, the blades prominently black-dotted beneath, with a row of brownish glands paralleling the margin. Inflorescence terminal, its branches loosely articulate. Calyx 5-parted, conspicuously black-dotted, with one or more rows of brown glands at the apex and sometimes also paralleling the margins, its lobes convolute. Corolla 5-lobed, its lobes convolute, reflexed, glandular dotted. Stamens 5, united nearly to the middle into a tube, free above; anthers cordate. Ovary 1-celled, several-ovuled; style simple; stigma simple.

The genus *Walleniella* differs from all other West Indian genera of Myrsinaceae in its staminal tube, the filaments being united to about the middle. It is apparently closely related to *Conandrium* of the East Indies. Although rather distantly related to *Wallenia*, the plant suggests that genus in habit.

Walleniella cubana P. Wilson, sp. nov.

Leaf-blades elliptic-oblanceolate, 6.5–9.3 cm. long, 2.3–3 cm. broad, obtuse at the apex, acute at the base, obscurely toothed above the middle, glabrous on both sides, the primary veins elevated; petioles 3–4 mm. long; branches of the inflorescence and pedicels puberulent; calyx-lobes elliptic or elliptic-ovate, 1.2–1.5 mm. long, about 1.2 mm. broad, ciliate; corolla-lobes elliptic, 4 mm. long, 2.2–2.5 mm. broad, rounded at the apex; filaments glabrous; ovary ellipsoid, glabrous.

Wet woods, slope of Loma Cardero, 1050 1200 m. altitude. (*George Conrad Bucher, 8*) [PERCY WILSON].

[2] **Xolisma Turquini** Small, sp. nov.

A low shrub with red-scurfy twigs; leaves rather close together on the branches, the blades oval, ovate, or orbicular-ovate, 3–4 cm. long, broadly obtuse, rounded, or sub-truncate at the apex, entire or sometimes undulate-margined, green and glabrous above, pale and scurfy beneath and pubescent with red or reddish hairs on the veins, rounded or truncate at the base, short-petioled; racemes cluster-like, borne in the upper leaf-axils, the pedicels red-scurfy like the twigs; calyx-lobes 5, lanceolate, about 4 mm. long, acute, scurfy; corolla white (?), urceolate, about 5 mm. long, less scurfy than the calyx, the lobes ovate-lanceolate, much shorter than the ribbed or ridged tube, acute; filaments very slender, nearly 4 mm. long, slightly dilated at the base; anthers about 1.5 mm. long; capsule not seen.

Collected on Pico Turquino, April 10, 1922 (*George Conrad Bucher, 9.*)

This is the twelfth species of *Xolisma* known from the island of Cuba. It is related to *Xolisma calycosa* which was discovered in the mountains east of Santiaga, Cuba, in 1911. It differs, however, from that species in both the foliage and the flowers. The leaves are broad-based and short-petioled instead of narrowed into the rather long petiole; the calyx is smaller and with narrower lobes and the corolla is prominently ribbed or ridged as compared with the even corolla of *X. calycosa.* [J. K. SMALL.]

known otherwise from mountains of Mexico and Central America.

11. **Micromeria Bucheri** P. Wilson.[3] A shrub of the Mint Family on the slope of the first peak.
12. *Pilea.* Collected without flowers on first peak at about 6700 ft.
13. A small tree of the Melastomaceae, foliage only collected. Summit of the main peak.
14. *Rapanea ferruginea* (R. & P.) Mez. A small West Indian tree of the Myrsine Family. Summit of the main peak.
15. *Palicourea alpina* (Sw.) DC. A shrub of the Madder Family, inhabiting mountains of the Greater Antilles.
16. *Dendrophthora buxifolia* (Lam.) Eichl..A Cuban mountain Mistletoe. Summit of the main peak.
17. *Ditta myricoides* Griseb. A low shrub of the Spurge Family, inhabiting mountains of Cuba, Hispaniola and Porto Rico. Summit of the main peak.
18. *Miconia*, near *M. cubensis* (Griseb.) C. Wright. A small tree of the Melastoma Family. Summit of the peak, in young fruit.
19. *Myrica.* A mountain Bayberry; small tree, with small obovate leaves, densely resinous and strigose beneath. Summit of main peak.
20. *Hedyosmum* (?). Summit of main peak; foliage only.
21. *Lepanthes.* A small epiphytic orchid, in wet woods near the summit.
22. *Elaphoglossum.* Young specimen of an epiphytic fern in wet woods to main peak.

[3] **Micromeria Bucheri** P. Wilson, sp. nov.

Perennial, the slender branches, woody, densely pubescent. Leaf-blades ovate, ovate-roundish or oval, 5–10 mm. long, 3.5–9.5 mm. broad, obtuse or rounded at the apex, acute at the base, dark green and stellate pubescent above, hoary stellate-pubescent beneath, the slender petioles 1–3 mm. long; calyx fluted, about 5.5 mm. long, stellate-pubescent, its lobes triangular-ovate; corolla yellow, 17–18.5 mm. long, pilose, the tube narrowly funnel-shaped, the lobes rounded.

Slope of Pico Turquino, about 2000 m. altitude (*George Conrad Bucher, 11*).

In leaf-form and pubescence this species of *Micromeria* resembles *M. viminea* (L.) Urban, which is native to Cuba, Hispaniola and Jamaica. There is, however, a striking difference in the size of the corollas, those of *M. Bucheri* measuring up to 18.5 mm. long, while those of *M. viminea* are only 5 or 6 mm. long. [Percy Wilson.]

23. *Elaphoglossum.* A barren leaf of a mountain fern, collected on the main peak.
24. *Clastobryum americanum* Cardot. A moss on summit of the main peak. Hitherto known fron South America and Jamaica.
25. *Pilotrichella flexilis* (Sw.) Jaeger. A moss inhabiting the high mountains of Cuba and Jamaica. Summit of the main peak.
26. *Trachypus viridulus* (Mitt.) Brotherus. A moss hitherto known from South America, and on John Crow Peak, Jamaica.
26a. *Meteoriopsis patula* (Sw.) Brotherus. A moss collected with No. 26 on the summit of the main peak, known from the mountains of Cuba and Jamaica.
27. *Campylopus Brittoniae* Williams. A moss, hitherto known only from Sir John Crow Peak, Jamaica. Summit.
28. *Holomitrium calycinum* (Sw.) Mitten. A West Indian mountain moss collected on the summit of the main peak.
29. *Cladonia aggregata* (Sw.) Ach. Summit of the main peak. (Det. Williams) A lichen hitherto unrecorded from Cuba.

N. L. Britton
Percy Wilson

THE NEW MANSION APPROACH ENTRANCE AND FENCING ON PELHAM AVENUE

Through the expenditure of a legacy of $5,000 received in 1920 from the estate of the late Louisa Combe, amounting, with interest to $5,375, appropriated by the Board of Managers for the purpose, an attractive entrance to the Garden was built in 1921 on Pelham Avenue, east of the Bronx River at the southern end of the driveway leading north to the Lorillard Mansion, together with over 100 lineal feet of the standard wall and fence planned to ultimately surround the reservation on street and parkway frontages.

The entrance, designed by Mr. John R. Brinley, Landscape Engineer, consists of a driveway flanked by paths for pedestrians. Either side of the driveway and between it and each path is a massive gate post. Terminating the boundary fence and at the outer side of each path is a smaller post. The central gate posts

are surmounted by carved finials of the conventionalized pine-apple type, and a bronze tablet, set on one of the entrance piers, was unveiled by Miss Elizabeth Billings, a member of the Women's Auxillary, during the Spring Inspection of Grounds, Buildings and Plantations on May 4th, 1922. This tablet bears the following inscription:

THIS ENTRANCE
AND THE
ADJOINING FENCE
WERE BUILT IN 1921
THROUGH A BEQUEST OF
LOUISA COMBE
NEW YORK BOTANICAL GARDEN

Through the expenditure of a part of the Special Development Fund of 1922, subscribed by members of the Garden, the wall and fence construction is progressing this summer eastward for over 300 lineal feet from the Mansion Approach Entrance, where grading and path-building is also being accomplished.

WATERLILIES AT THE BOTANICAL GARDEN

One of the most attractive of the mid-summer displays is that afforded by the waterlilies in the two large pools just outside the entrance to conservatory range I and in the aquatic house of that range. Very properly these beautiful plants enjoy much popularity, for since the earliest historic times their unique flowers have adorned art and poetry, and, among the early Egyptains their starchy rhizomes were an important diet. Among the comparatively few plants known to ancient botanists the white and yellow waterlilies had an important place, and we find the three names characterizing the group—*Nymphaea*, *Nuphar*, and *Lotus*—used by Theophrastus and Dioscorides. By Theophrastus the yellow and white groups were confused under the two names *Nymphaea* and *Nuphar*; but Dioscorides writing at a later date called the white lilies *Nymphaea* and the yellow *Nuphar*. Linnaeus, however, placed them all under the

single generic name of *Nymphaea* in his Species Plantarum of 1753; but a few years latter in the sixth edition of Genera Plantarum 1764 mentioned *N. lutea* and *Nelumbo* as differing from the white species which he evidently considered, at this time, typical of the genus *Nymphaea.* According to the rules of nomenclature, present-day botanists retain the name *Nymphaea* for the yellow or cow-lilies and refer the white group to *Castalia*, a name coined by Salisbury in 1805.

Because of their floral structure they occupy a very interesting place in the vegetable world, for the perfect gradation from sepals to carpels beautifully illustrates the historical origin of floral parts from the modification and functional specialization of sporophylls.

Exhibiting in the petals of various species respectively, all the primary colors, blooming both by night or by day according to kind, being distributed over the whole earth wherever fresh-water in sluggish streams or pools is found, and illustrating in their methods of propagation all of the common means of reproduction—seed, rhizome division, and in some species young plantlets produced at the leaf base—this group of plants is one of the most educative that may engage the mind of thoughtful naturalist or gardener.

Their large flowers of classic shape and tropic beauty in a variety of delicate shades among the modern hybrids, make them excellent subjects for a striking landscape effect wherever the proper conditions may be provided. The large and beautiful leaves form a suitable background against which the flowers show to full advantage. If thought is used in selecting varieties, the punctual habit of blooming may be used to advantage to produce a continous show of blooms. Some gardeners have even contrived a floral clock, timed by the opening of the flowers.

A few notes on the methods used in cu'tivating waterlilies and the varieties grown at the Garden may interest their friends. The tender or tropical species may be grown to bloom either in an aquatic greenhouse or during summer months in open pools; but will not endure low temperatures and are of course killed by freezing. These however, are very beautiful, and their flowers well repay the care they need. They are best grown from seed which is collected by bagging the pollinated flowers

just before it is drawn down below the surface of the water by the coiling flower stalk to mature its seeds. If not bagged the bouyant arils would float and disperse the seed widely over the water as nature intended. About the middle of March they are sown in seed-pans in a soil mixture of 3 parts garden loam, 1 of leafmould, and 1 of sand. These pans are then placed under about two inches of water kept at from 75–80 degrees. At the appearance of the first floating leaf, they are taken out and potted into 2½ inch pots thence to be shifted as they grow to 3, 4, and 5 inch pots successively till they are ready for the large tubs in which they are to be set either in the outdoor pool when the nights are sufficiently warm or in the aquatic house earlier in the season. At this stage the night temperature should be about 70 degrees.

The tubs in which the waterlilies are to bloom should be strongly made, about two feet deep and twenty-two inches across. They are placed from 5 to 6 feet apart so that the developing plant may not be crowded when its leaves spread out on the surface. A soil mixture containing 3 parts of soil, 2 of manure, and 1 of leaf-mould is satisfactory. The plants should be firmly set, and the soil packed moderately tight and to a distance of 1½ inches from the rim, then filled up with coarse sand, thus preventing the washing away of soil. The water should be let in deep enough to cover the tubs five inches at first, then after some growth has taken place, to a depth of eight inches. One may profitably take notes on the character of leaf and flower during the growing season and preserve the best plants for the next year.

About the middle of November for those indoors and earlier for those outside, when the leaves begin to wither, the plants are lifted and brought into the greenhouse and heeled-in with soil just covering the crown. When after a month or more the leaves dry away place the tubers in pots of sand and keep them under the greenhouse benches at a temperature of 55 degrees and rather dry during this their resting stage.

These "seedling tubers" as they are called, will produce strong plants for the coming year. They may be started about the middle of March, potted in a soil mixture of 2 parts of soil, 1 of manure, and 1 of leaf-mould in 3 inch pots under water at

a temperature of 75 to 80 degrees, and from this point on, treated like seedlings.

The culture of the royal waterlily of the Amazon, *Victoria regia*, or its more commonly cultivated variety, *V. Trickerii*, is essentially similar save that it is started at a somewhat higher temperature, 80 to 85 degrees, and grown during flowering period at about 80. Care should be used when shifting the seedlings to larger pots to set them a little deeper as the plant develops, and in placing in the tank where they are to flower, to give more space and somewhat richer soil, for the Victorea is a giant.

Hardy lilies are cultivated in the same manner as the tender species, with this difference, that they may be allowed to remain in the pool where they bloom when winter comes.

There are about forty species of *Castalia*, which is the largest genus cultivated, and a large number of named varieties resulting from recent hybridization, of tender and hardy sorts. Here is given a list of those grown at the Garden. In the case of horticultural varieties it is often impossible to be sure of relationships; but the following list has been arranged to show this as truly as may be learned from literature on the subject and the appearance of the plants themselves.

TENDER DAY-BLOOMING CASTALIAS

C. coerulea (light blue).
C. ovalifolia (white turning blue).
C. o. var. *Mrs. Edward Whitaker* (blue).
C. micrantha Daubeniana (light blue).
C. m. D. var. *Mrs. Woodrow Wilson* (light blue).
C. m. D. var. *Panama-Pacific* (purple).
C. m. D. var. *Wilson Gigantea* (dark lavender-blue).
C. stellata var. *Grossherzog Ernst Lugwig* (violet-blue).
C. ampla (white).
C. gracilis (*C. flavo-virens*) (white).
C. g. var. *Mrs. C. W. Ward* (deep pink).
C. g. var. *Wm. Stone* (violet-blue).
C. g. var. *Wm. Becker* (violet-purple).
C. pulcherrima (light blue).
C. p. pennsylvania (blue).
C. capensis (sky blue).
C. madagascariensis zansibariensis rosea (pink).
C. castaliflora (pink).

TENDER NIGHT-BLOOMING CASTALIAS

C. dentata magnifica (cream-white).
C. Deaniana (light pink).
C. kewensis (pink).
C. Sturtevantii (bright red).
C. Omarana (light and dark pink).
C. Bissetii (pink).
C. devoniensis (rosy red).
C. d. var. *Geo. Huster* (crimson).
C. d. var. *Frank Trelease* (pink).

HARDY CASTALIAS

C. odorata (white).
C. o. sulphurea (yellow).
C. o. s. grandiflora (yellow)
C. o. gigantea (white).
C. o. var. *Wm. B. Shaw* (rose pink).
C. o. var. *Helen Fowler* (deep pink).
C. o. var. *Eugenia de Land* (deep rose pink).
C. o. var. *Rose Aray* (clear pink).
C. Marliacea rosea (deep rose).
C. M. ignea (deep carmine).
C. M. carnea (pink).
C. M. rubra-punctata (rosy purple with carmine dots).
C. M. chromatella (yellow)
C. M. albida (white).
C. M. var. *Wm. Doogue* (shell pink).
C. M. var. *Arethusa* (crimson pink).
C. M. var. *Attraction* (garnet red).
C. tuberosa (white)
C. t. maxima (white).
C. t. rosea (pink).
C. alba (white).
C. a. candidissima (pure white).
C. a. Gladstoniana (white).
C. a. Laydekeri liliacea (rosy lilac).
C. a. L. purpurea (reddish crimson).
C. a. gloriosa var. *James Brydon* (crimson).
C. a. Andreana (red and yellow).
C. a. Seignoretii (pale yellow shaded with rose).
C. a. var. *Sioux* (bright yellow).

J. A. CRAWFORD.

SECOND GRANT FROM THE INCOME OF THE CHARLES BUDD ROBINSON FUND

This fund, amounting now to about $700, commemorates Dr. Charles Budd Robinson, a former student and assistant at the Garden who was murdered by fanatic natives of the Island Amboina, Dutch East Indies, in 1913, while prosecuting a scientific investigation on behalf of the Bureau of Science of the Philippine Islands. It yields income of about $30 a year and was subscribed by his friends as a memorial. The first appropriation made from the income was a grant of $50, in 1918, to enable Mr. Peter Nelson, of the Guam Agricultural Experiment Station to make a collection of herbarium specimens of the plants of Guam, in cooperation with Mr. E. D. Merrill, Chief Botanist of the Bureau of Science of the Philippine Islands.*

The second grant from the income, $75, has now been made to Rev. Dr. H. M. Denslow, Honorary Custodian of the local herbarium, to aid him in collecting botanical specimens in southern New York during the present summer, for the increase of the Local Herbarium.

NOTES, NEWS AND COMMENT

The following visiting botanists enrolled in the library during the spring: Prof. C. H. Ostenfeld, Copenhagen; Dr. O. Warburg, Berlin; Dr. J. P. Lotsy, Velp, Holland; Miss Nellie Carter, Birmingham, England; Miss Margaret S. Brown, Halifax; Prof. Caroline A. Black, New London, Conn.; Professors L. H. Bailey, H. M. Fitzpatrick, W. W. Rowlee and Miss Silence Rowlee, Ithaca, N. Y.; Dr. J. N. Rose, Mr. P. L. Ricker and Mr. W. W. Eggleston, Washington, D. C.

Over 700 biology pupils from Morris High School, with their teachers, spent the forenoon at the Garden on June 19. Museum and field work was done under the supervision of members of the Garden Staff.. At 10:30, the large hall was filled to overflowing by enthusiastic pupils eager to hear Mr. Inman lecture on forestry.

* Jour. N. Y. Bot. Gard. **19**: 47-48.

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The contribution of $5000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a patron of the Garden.

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The contribution of $1000.00 or more to the funds of the Garden at any one time shall entitle the contributor to be a fellow for life of the Garden.

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Annual members pay an annual fee of $10.00.
All members are entitled to the following privileges:

1. **Tickets to all lectures given under the auspices of the Board of Managers.**
2. **Invitations to all exhibitions given under the auspices of the Board of Managers.**
3. **A copy of all handbooks published by the Garden.**
4. **A copy of all annual reports and Bulletins.**
5. **A copy of the monthly Journal.**
6. **Privileges of the Board Room.**

7. Life Members

Annual members may become Life Members by the payment of a fee of $250.00.

Information

Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

Form of Bequest

I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....

Vol. XXIII August, 1922 No. 272

JOURNAL

OF

The New York Botanical Garden

EDITOR

R. S. WILLIAMS

Administrative Assistant

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA

INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

VOL. XXIII August, 1922 No. 272

REPORT OF WORK ON THE MULFORD BIOLOGICAL EXPLORATION OF 1921-'22

My botanical collections on this journey began immediately after crossing the divide of Quime-Cruz, on the eastern cordillera of the Andes, at an altitude of about 15,500 feet. This pass is just east of the railroad between Antofogasta and La Paz.

Previous to this time, I had obtained by purchase in the markets of Arequipa and La Paz a few commercial products for our economic museum, and one of the members of the party had obtained a quanity of *Bystropogon mollis*, for distillation and the study of its volatile oil, which is very similar to oil of pennyroyal.

The journey from the railroad station of Eucalyptus through the above-named pass was made by automobile, through the courtesy of Messrs. Guggenheim Brothers of New York, who own a tin mine near Quime. On the slope beyond the pass, I found enough water supply in early July to maintain a scanty growth of alpine plants. My collections here included two cactuses, two caiophoras, a ribes in fruit, and several senecios. From this point to Quime, at an elevation of about ten or eleven thousand feet, there was a steadily increasing display of plants in flower, and of ferns, on the sides of the valley, which were well supplied with surface water and with small streams entering the Quime River. The term "Pongo" means a beginning or commencement, and refers to the origin of some important stream or the commencement of a route to some important place. Hence there are a number of places so named, and they are distinguished by the addition of such a phrase as "de Quime," to indicate the locality. For several leagues on the road to

Quime, the number of specimens in flower was very large and the display was showy. Yellow and white were the predominant colors of the flowers. There were but few trees, and these very small, but the mountain sides were abundantly clothed with shrubs, large herbs, and half-shrubby plants. Circumstances having compelled me to precede the other members of the party, and to travel rapidly, I was unable to make any examination of this interesting flora, except during a few days' stay at Pongo, at an elevation of about 11,500 feet, and at a camp below Quime. Very prominent features of the flora along this route were half-shrubby species of crimson flowered *Virgularia*, a number of species of *Fagelia*, several species of *Bystropogon*, and a tall, slender, very spiny, pink flowered *Barnadesia*. These plants together constututed a large part of the vegetation of the mountain side. There were many grasses and ferns, but most of them were found at a season when collections were not to be made. The sides of the cliffs were covered with bromeliads, the "florida moss" being very conspicuous. When the wind was blowing, the extensive masses of this plant made it appear almost as if the face of the cliff was in motion.

As I had not been able to carry my driers with me, and had only a few old newspapers, I could obtain only scraps of the more interesting plants, which I dried by artificial heat. Dr. White came later and made a small, but exceedingly interesting collection on this portion of the route.

At Pongo, three species of *Berberis*, several of *Baccharis* one or more zanthoxylums, and a very large, shrubby *Poecilochroma* were very prominent. There were but few herbaceous plants in bloom. I collected some forty species at this place, but the specimens are small, poorly dried and of little value except for identification.

Below Quime, the soil rapidly became drier and the vegetation sere. From this point to Canyamina, at about 3,000 feet, a journey of several days by mule travel, the road is a succession of steep ascents and descents over high mountain spurs, most of their summits above tree level and with most of the vegetation sere. At several points, however, there were ridges and slopes known as "rain belts," where, due to local conditions, rains were occasional or frequent in the dry season, and the soil was moist. Here we found many plants in bloom. Among the more

noticeable, were two species of blackberry, many senecios and liaburns, a *Cosmibuena*, *Cinchona ledgeriana*, species of *Triplaris*, three fuchsias and a great variety of ferns. Shrubs in the Compositae and Rubiaceae, especially a number of senecios, were common, but could hardly be called abundant. An interesting feature of the landscape was a species of *Bombax*, absolutely devoid of leaves, and with short, thick, trunk-like branchlets, bearing its pure white flowers on the naked wood. The narrow petals and numerous, elongated stamens gave to these flowers the peculiar appearance of a mass of silken fibers. Near Canyamina, large cactuses of several species became common, and a great variety of orchids was encountered. Unfortunately but few of the latter were in bloom at this season (early July). One of the cactuses growing in this region forms a large tree and is perhaps the largest species of cactus in the world. One which we photographed and measured was about 55 feet in height, with a spread of crown 43 feet wide, and with a trunk, 7 feet 8 inches in circumference 3 feet above ground. Here also the forests were largely composed of Mimosaceous trees, which furnished the most important timber of this region. A few trees and shrubs in the Melastomaceae were here encountered.

At Canyamina, a stop of several days was made, after our collecting outfit had arrived, and rather large collections were made, in spite of the fact that the dry season was still in force. Fruiting specimens largely predominated over those in flower. We were interested here in finding an abundance of the genuine matico plant (*Piper angustifolium* R. & P.) and a photograph of a large shrub of this species was obtained, probably the only illustration of it in existence. The bark of a tree called "vilca," apparently a *Piptadenia*, finds an important use in hastening the fermentation of cane juice, for the making of alcohol, which is the important industry at Canyamina.

Ferns grew in great abundance and in fair variety, and meibomias made a dense growth along the streams.

The most striking character of this entire journey from Pongo to Canyamina is the restriction of habitation, owing to the absence of grounds level enough for cultivation. At every point where the canyon opens out into a valley with sloping sides, notwithstanding that these slopes are exceedingly steep, a town or village has been located and every yard of land level

enough for tilling is utilized for crop production. It is a most interesting sight to view the side of a large mountain dotted with cultivated plots, varying in size from a few thousand square feet to many acres, with their outlines very carefully marked by walls, in order that there shall be no danger of the owner losing any portion of his tillable land. Some of these plots are at long distances from the homes of their owners and are so elevated that the latter must climb from one to three thousand feet above their cabins in order to work them.

Canyamina itself is at the head of a long and broad valley affording tens of thousands of acres of rich, tillable land. Hundreds of acres are here planted with sugar cane. Although this cane is not of good quality, the fact is due, not to any defect in the soil or climate, but to the fact that the same plants have been yielding cane for long periods, some of them as much as forty years.

At this point I made a most interesting observation, and one which throws a good deal of light on plant conditions in the Andes. I found a patch of bananas that was gradually slipping, along with the adjacent soil, into the small river at the bottom of the valley. I was assured by the gentleman in charge of the plantation, a thoroughly intelligent and highly educated French engineer, that within ten years this banana patch had been located high up on the hills and distant several hundred yards horizontally from its present position, Its displacement has been perfectly gradual, so much so that the life of the plants themselves has not been interfered with.

From Canyamina, a day's journey by muleback brought us to the junction of the rivers La Paz and Meguilla, which form the Bopi River. Near here, on the edge of a vast rocky playa, is located Espia. There are no houses here, it being merely a locality, bearing this name because of its importance as a junction of the route from La Paz, via Chulimani, to Canyamina and Cochabamba, and the down-river route on the Bopi to the eastern Andean region. This region is interesting because of the great extent of its cactus flora. It is not an arid region, although very dry during the dry season. Its cactuses are peculiar. One of them is the very large one to which allusion has already been made, and which is very abundant. Another one is either a form of the former, or a very closely related species.

Since there were no blossoms or fruits, I could not decide this point. Another is tall, very slender, and perfectly erect, with the exception of (sometimes) erect, slender branches growing close to the main trunk. It is often thirty or forty feet high, and has many shallow grooves and ridges. There were no flowers or fruits, and I could not even guess at its identity. A very peculiar *Opuntia* grows here. It is perfectly erect and very straight, and bears branches only at the top, these forming a small and compact crown. It grows in the dense forest and as its crown is pushed upward, it loses the branches below, which leave scars. Eventually it may become thirty or forty feet high. I have photographs of all these species. One or more s›ecies of *Epiphyllum* are abundant, and here and there is a *Rhipsalis* which festoons the large trees in the river bottom very densely. The stems hang vertically and sometimes attain a length of ten feet. Also a *Pereskia* with pink flowers often lines the roadsides, its stems very long and slender and partially reclining.

Except for a narrow fringe along the stream, the vegetation in this locality was absolutely sere at the time of our stay there, and most of the trees were bare of leaves. Some of the ferns and some other small herbaceous plants possess the peculiarity of curling up tightly during the dry weather and opening out again when the rains occur. Climbing over rotten logs and rocks and tree trunks there was an abundance of exceedingly thick leaved, fleshy polypodiums and peperomias. The former possess fronds of two forms on the same plant, one ovate and cordate, the other lanceolate. We were informed that within a few leagues there were high, elevated regions where the vegetation was always fresh and fertile, but circumstances prevented me from reaching them.

In spite of these unfavorable conditions, we secured a rather large collection before leaving Espia, which I am inclined to think will be unusually interesting.

Our next stop was at Huachi, just below the junction of the Bopi and Cochabamba Rivers, which together form the Beni. This journey, of about 4 days, was made by callapo, consisting of two rafts of ochroma wood lashed side by side. It is one of the most difficult and perilous raft journeys in South America, large amounts of property, and occasionally lives, being lost in the rapids. One of our own callapos was there smashed, and consid-

erable valuable property was lost, all of the remainder being water soaked and more or less damaged.

The Bopi River runs through high mountains, mostly difficult of ascent. The bad rapids begin when one is about two-thirds of the way from Espia to Huachi. The current is exceedingly swift and the river bed is filled with huge rocks, which make the entire journey decidedly dangerous. The men who navigate the rafts are Indians, called balseros, and they are wonderfully strong and skillful in this work. At several points, it is necessary to make portages by land. The worst dangers occur at a point (Rapids of San Fernando) where the river is hemmed in by precipitous cliffs, so there is no possibility of making a portage and one has to shoot the rapids and dodge the rocks. It is here that most of the accidents occur and where we suffered disaster. Some of the cliffs along the river are of such height and appearance as to be exceedingly impressive. I think it impossible for any intelligent man to pass through these canyons without being quieted and subdued in spirit. These cliffs are covered with the most interesting plants, huge bromeliads being the most conspicuous.

It is a matter of the deepest regret with me that we could not stop by the way and make collections on these steep mountain sides. The cost of our journey here amounted to about one hundred dollars a day, and the men's food supply was very limited, so that we could not afford to tarry, and our collections had to be confined to the immediate shores of the river. I can imagine no more profitable way of spending a season than for a party to go properly equipped for depending upon themselves and collecting systematically in this region.

The conditions of vegetation along this river vary greatly at different points and this variation is of the greatest interest. A day's journey below Espia, the sere hillsides give place to moist slopes covered with luxuriant vegetation, including an abundance of flowering trees and shrubs. Farther down, other similar sudden alternations between arid and moist conditions were encountered. Most of the trees of the arid belt were deciduous and of course leafless at this season. Every possible opportunity was utilized for making collections in these two classes of regions; but these collections cannot be characteristic, because they had to be made near the stream, where the full effects of the aridity did not manifest rhemselves. It is to be noted that even in the

localities which were verdant, the percentage of plants in flower was not large. All things considered, therefore, I should say that our collections represented not more than five percent of the species that were within sight as we traveled.

At Huachi, we were obliged to remain for ten days, while awaiting the rafts by which alone we could pursue our journey. Here, the beginning of the rainy season was bringing many plants into bloom, and we managed to keep our driers almost fully occupied. It was rather notable that each day brought new plants into bloom in the localities visited the day before. That is to say, the blooming season of the species comes on with great suddenness. Not only did we collect the plants of the immediate vicinity of the little settlement, but we made rather extensive and important excursions from this base. Dr. White was most energetic and persevering in these side trips, which were made with great difficulty and subject to considerable hardship. Perhaps the most notable piece of work performed at this place was the investigation of the sources of Coto and Para-Coto bark. These are important medicinal barks, the botanical origin of which has been entirely unknown, except that they were evidently members of the Lauraceae, For many years past, practically all of our supplies of these barks have been wholly spurious. It was our object to determine not only the species that yielded them, but the causes of this defect in our supplies. Dr. White carried out these investigations, as I was unable to travel by land. He found a number of species of trees, very similar and very closely related, the barks of which have been collected under these names. He collected bark and herbarium specimens from identical trees. One of them proved to be the genuine Coto and another the genuine Para-Coto. The species yielding the spurious bark were found to be closely similar to those yielding the genuine ones, so that it appears almost certain that the incorrect collections have been due to accidental errors on the part of collectors. I believe that the result of Dr. White's work will be to establish the possibility of securing perfect supplies of these barks in future.

While Dr. White was making these land journeys, over steep mountains and through difficult jungles, exposed both by night and day to very inclement weather, I arranged a return trip up the river, on an economical basis, and spent about two weeks in collecting the flora of the lower Bopi. I had intended to go much

farther up than I did, and anticipated great results from the excursion, but in this was greatly disappointed. One of my companions was attacked with a severe remittent fever, immediately after which he developed a large abscess in his arm pit. His condition was rather serious and threatening, so that we were obliged to encamp and give him suitable conditions for safety. At this particular time I suffered a severe attack of neuritis and was almost completely incapacitated. Nevertheless, I did, with much discomfort, keep my driers working almost to full capacity and obtained many interesting species.

It may be remarked that this is one of the richest game countries that I have ever encountered. There were many deer, wild hogs of two species, tapirs and cornejos, besides a great abundance and variety of large, edible birds, there known as *pabas*, meaning turkeys.

Much of our time while on the lower Bopi was devoted to studying the economic elements of the flora and the studies of our collections in this department will doubtless form the subject of a number of special papers.

A very interesting observation made here was in connection with the burning of the cane brakes or bamboo jungles along the river bottom. It has been learned by the natives that after these bamboo thickets are burned away, ochroma trees spring up in considerable abundance. This being the wood from which their rafts are made, it is of the greatest importance to them, and they seek this means of promoting its production. On the first occasion when we observed this burning going on, I was startled by the loud and incessant explosions which resulted. The sounds were like those of the firing of heavy muskets or small cannons and were very noticeable at a distance of two or three miles. Investigation showed that this was due to the explosion of the bamboos, the hollow joints of which contain water. This water being vaporized by the heat, thousands of explosions resulted, producing the impression of an active and continuous bombardment.

The Beni, below Huachi, being free from impediments, we travelled with callapos comprised of three rafts, and were less hurried in our movements than on the upper river. This portion of the route I had traveled in 1886, but under conditions that precluded collecting until after the Andes had been passed. On the present occasion, we were still faced by adverse seasonal

conditions, almost all of the plants being in the transitional state between fruiting and flowering. Six days' journey carried us through the last half of the Andes and landed us at Rurrenabaque, just at the base of the last foothill. On my previous journey, there was nothing at this point except a house or two in a clearing of the deep jungle. Now there was a good sized town here, with many outlying plantations and haciendas. A few years ago the place was twice as large, as to population and business, as at present, the loss of the rubber industry being chiefly responsible for its decline.

Here we established our headquarters and maintained them until the end of the year, making many important excursions to other localities. Here again Dr. White was exceptionally active. He returned up the river and ascended side streams and climbed mountains, with the special object of securing orchids, of which, however, comparatively few were obtained, as they were not yet in flower. He will undoubtedly write an account of his work in this region, which must prove of exceptional interest and importance. He also visited Tumupasa and Ixiamas and made important collections, being accompanied by Mr. Martin Cardenas, the botanical student sent by the Minister of Instruction of Bolivia to secure instruction in field work.

During this period, my lameness had so increased that it was very painful for me to get about and my ability to work was quite limited; nevertheless large collections were made and the specimens were shipped home. The specimens were very carefully wrapped in double thicknesses of heavy waterproof paper taken with us especially for this purpose and the bundles were securely packed in boxes which we had also taken with us for this purpose, in the form of shooks. It was supposed that they must arrive in good condition, and they would have done so under ordinary circumstances. As it turned out, however, in their long journey to the ocean steamer for New York, during which they were subjected to various changes of transportation, they must have been transported under full exposure to the tropical rain, or else they must have been transported in such a way that the boxes stood in water. On opening them in New York, it was evident that the packages had been watersoaked for weeks. Everything was done to dry them out and save them, but they had suffered a great deal of damage.

The flora of the region under discussion is so diverse that little can be done in the way of generalization of its elements, yet there are certain features that should be reported here. At this season (December) fruiting specimens were largely in the ascendancy, so that our collections are in general complementary to those which I obtained in 1886 and to those of Mr. Williams, collected in the same general region while on the Conway Expedition.

This region excels all others known to me in the number of its native edible fruits. Many of these are of good quality and some of them are of real excellence, and well worthy of cultivation and improvement. A large collection of these was obtained and preserved in formaldehyde for our Economic Museum. Since they could only be preserved in glass jars, of which our supply was limited, duplicates could be collected in only very sparing amounts, but we have enough to furnish a good collection to Dr. Oakes Ames and a fair collection to the Brooklyn Botanic Garden.

Many of the plants collected about Rurenabaque are used medicinally by the natives. While few if any of them are likely to prove of sufficient medicinal value to be of practical importance to the materia medica, knowledge of them is not devoid of scientific interest. At least four species of *Guarea* were there found which had yielded commercial supplies of a valuable medicinal bark. Rurrenabaque is the river port by which access is given to the town of Reyes, eight leagues in the interior. At the time of my former visit, there were two such ports, the one below Rurenabaque being at one angle of an almost equilateral triangle with Rurrenabaque and the town of Reyes, at the other two angles. In the meantime, the river has so changed its course as to leave the lower port, Salinas, miles away from the present channel of the river.

In planning for this journey of exploration, great hopes had been entertained of the results of a journey to the little known Lake Rogagua, located in the pampas to the northeast of Reyes. I had hoped to settle the much discussed question as to whether the waters of this lake drain into the Beni or into the Mamore, and I had expected to make very extensive collections about its shores and on the road between it and Reyes. My disappointment was inexpressible on finding that the season had not advanced beyond the point of getting the early spring vegetation well started, with only the very earliest of spring flowers in evidence. A careful examination of the young plants showed that our col-

lections in flower did not represent more than one in twenty of what could be secured in the course of an entire season. The conditions relatively were about what would be encountered in the vicinity of New York in the middle of April. We were also disappointed to find that the outlet of the lake would not be capable of navigation before late February or March so that we were obliged to cut short our stay and return to Rurrenabaque with a very small botanical harvest.

The flora of this region possesses features of great phytographical interest, of which enough was learned to entitle the subject to treatment in a separate communication.

Before we could reach the Beni again, my health had become so poor, and my capacity for action so limited, that I feared becoming an encumbrance to the rest of the party and I determined to descend the river as rapidly as possible, and endeavor to secure improvement at the English Hospital of Candelaria, at the eastern terminus of the Maderia & Mamore Railroad and at the foot of the lowest of the falls of the Madeira. I therefore bade adieu to my companions and dropped down the river on a raft until I encountered the little Bolivian Government launch Beni, which carried me to the town of Riberalta near the uppermost of the falls.

Before leaving Rurrenabaque, careful arrangements were made for the continuation of the field work of the party. While at Canyamina, I had granted the request of the Bolivian Minister of Instruction, to permit two government students to accompany us and secure training in field work. Of these, Mr. Martin Cardenas specialized in botany and Mr. Lopez in entomology. Both had proved themselves assiduous students and industrious collectors. It was now arranged that Mr. Cardenas should continue collecting under the direction of Dr. White. While Dr. White himself made side trips, Mr. Cardenas was to collect the flora about Rurrenabaque, which was now rapidly coming into flower.

While at Riberalta, I engaged a small launch and a crew for a month's voyaging by the other members of the party when they should arrive there, enabling them to work along the Beni and the streams entering it. In this way, our botanical collecting was continued for a considerable time after my departure.

At Candeleria, I was informed that my condition would not justify returning to the party or engaging in any farther field

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work after their arrival at that point. I therefore decided to return to New York after making all possible arrangements for the comfort and success of the party on their way down the river.

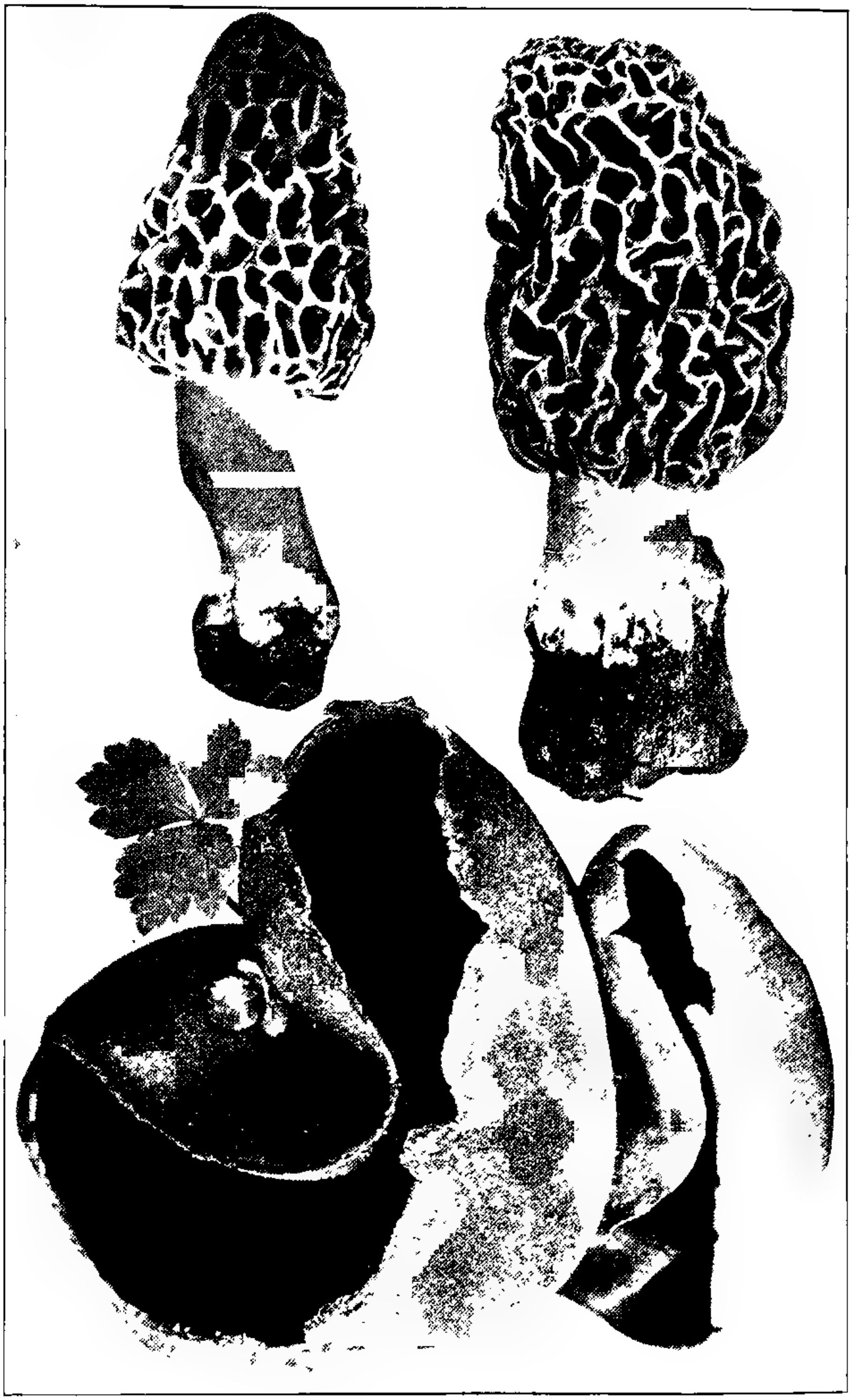
On my way down the Madeira, I was much impressed with the extent of the industry of Brazil-nut collecting. Many stops were made by our small steamer, by night as well as by day, for shipping hundreds of tons of these nuts which largely constituted our cargo. The nuts were stored in buildings and cribs along the river bank, from which they were either carried on board in bags and baskets, or shoveled directly out of canoes and barges, moored alongside of our vessel. They were dumped for measurement into a standard barrel kept for the purpose and then thrown into the hold.

H. H. RUSBY

SOME EDIBLE CUP-FUNGI.

The fungi have been used as articles of food since ancient times. Not only are their food values known to man but some of the lower animals are almost entirely dependent upon certain species which form their staple articles of diet and are apparently as essential to their existence as the potato is to the people of Ireland. This is especially true of the leaf-cutting ant, by far the most destructive insect in certain parts of the tropics. Living in great underground houses these ants scour the country often for miles, in search of suitable trees. Having located the object of their search they ascend the trunk of the tree, cutting off portions of the leaves many times their own size. These are carried down the tree and back to the nest over well beaten paths prepared for this purpose, the work often continuing until the tree is entirely defoliated.

Within the nest the leaves are cut into small bits which are gathered into little heaps and serve as the substratum for the growth of a certain species of fungus, the mycelium of which produces enlarged growths, the part of the fungus which is eaten by the ants. It is claimed that these enlargements are abnormal and are brought about by some unknown cultural process. This and several other species of ants have thus not only discovered the food value of the fungi, but have become expert mushroom growers.



MORCHELLA ESCULENTA
PEZIZA BADIA

So far as man is concerned, the edible fungi belong to one of the two large groups, the basidiomycetes and the ascomycetes. The fungi most frequently collected for culinary purposes belong to the former and comprise such forms as the common mushroom, *Agaricus campestris*; the shaggy mane, *Coprinus comatus*; the beef steak fungus, *Fistulina hepatica*; and the common puffballs, all of the latter being edible if collected at an early stage of development. There are several reasons for the more frequent use of this type of fungus, probably the chief of these being the fact that such forms are more abundant, more frequently collected and consequently known to the mushroom eater.

The second large group, the ascomycetes, contains some of the most valuable edible forms, but are much less frequently encountered by the amateur. The most valuable of the edible ascomycetes are the underground forms, known as the truffles, which naturally on account of their subterranean habits are seldom seen except by those who find them by accident or who search for them with the aid of trained animals, pigs or dogs. This group has been discussed in an earlier number of the JOURNAL.*

A number of the cup-fungi while perhaps less valuable than the truffles are not only palatable but quite delicious and often occur in sufficient quantities to be of practical use as articles of diet. The so-called cup-fungi are again divided into two groups, the morel type and the true cup-fungus, so named because of the form of the fruiting bodies which are often decidedly cup-shaped. The former while included with the cup-fungi are not decidedly cup-shaped but include such forms as *Morchella* and *Helvella* or *Gyromitra*, this type of fungus being provided with a stem and head or cap. Of these, *Morchella esculenta* (plate 274) is the commonest and most widely used. This is the common morel and on account of the numerous pits in the head is often known as the "honeycomb fungus."

The common morel occurs almost exclusively in the early spring and is sometimes referred to as the "spring mushroom." In the northern states, the month of May is the most favorable season, while in the southern states and the Pacific northwest it often occurs a month earlier. Of twenty three specimens examined in our collections, nineteen were collected in the month

*Journal of the New York Botanical Garden 19: 307. 1918.

of May and the remainder in April. Of those collected in April, one was from Washington state and two from Alabama where the season is earlier. In the northern states they may occasionally occur during the latter part of April. There are several recognized species of *Morchella* but with one of two exceptions they are so similar that it is not easy to separate them with certainty.

The mycelium of the above species is apparently perennial, as is doubtless the case with many other species of fungi, the fruiting bodies often appearing year after year in the same place, fruiting at about the same time each year, the abundance of fruit depends upon the nature of the season, the amount of rainfall, etc. They often occur in apple orchards, especially where wood ashes have been used, but may also occur in the borders of woods. In some European countries the ground in woods is burned over in order to insure a bountiful crop. So far as known attempts to grow the species artificially have been unsuccessful.

The morel is often found in abundance. Underwood * reports having gathered eighty-two fruiting bodies around an old stump in his back yard in Indiana, and in an apple orchard, twice as many. He refers to the morel as "a storehouse of nitrogenous food as luscious as an oyster and for an equal weight containing even more nutritious matter." In the same article he states: "It is safe to say that the total natural production of morels in the state of Indiana during each spring is not less than 50,000 bushels, and may be easily double that. These, in a fair market, are worth $200,000 and in the best markets would command a much higher price. With the exception of a few plants eaten here and there by a family, this wealth of food so much esteemed in foreign countries by peasant and wealthy epicure alike, is shamefully allowed to go to waste. The peasants of Germany call the fungi 'the manna of poor' while the ancient Greeks justly regarded them as 'food of the gods.' Any bright boy could make large wages collecting and selling these plants, and with little effort the people would learn to esteem them as they do oysters now. There is no reason why they should not be as commonly exposed for sale by grocers as they are in foreign countries."

*Trans. Indiana Hort. Soc. **1893**: 63. 1894.

Since the fruiting season of the morel is short, they could be collected and dried for future use, thus making use of the excess crop. In Europe they are often strung and hung in festoons in the houses, much the same method as used in drying apples in early days.

All of the species of *Morchella* are edible, not one of them having even been under suspicion, so that it is not necessary here to attempt to diagnose the species. The following directions have been given for preparing and cooking: "Having washed and cleansed them from earth, which is apt to collect between the plaits or hollows of the plant, dry thoroughly in a napkin and put them in a saucepan with pepper, salt and parsley, adding or not a piece of ham. Stew for an hour, pouring in occasionally a little broth to prevent burning. When sufficiently done, bind with the yolks of two or three eggs and serve on buttered toast." These directions may be varied to suit the taste. They may be simply cleaned, stewed and fried in butter, the stewing being essential, since they are rather inclined to toughness.

The species of *Helvella* which differ from *Morchella* in that the cap is smooth or folded into brain-like convolutions are also edible although some of them are under suspicion and are thought to be slightly poisonous when old, and should therefore be handled with a little more caution.

The true cup-fungi are less frequently used as food than the morels. While most, if not all, of the species are edible, many of them are too small to be of any food value. A few, however, attain considerable size, are quite palatable and often occur in sufficient numbers to be of practical food value. Among these is the brown cup-fungus, *Peziza badia* (plate 274), which occurs in open woods or on burned ground. In this species the cups attain a diameter of three or four inches. The substance is rather thin and inclined to be tough, resembling in this the morels. The methods of cooking are identical. So far as the writer is aware, none of the true cup-fungui are poisonous so that these plants may be experimented with without especial danger.

F. J. SEAVER.

NOTES, NEWS AND COMMENT

The dahlia border for 1922 occupies the same ground as last year. The planting was done on the 9th and 10th of June and was succeeded by heavy rains which were not altogether favorable for newly planted roots, but, for dahlias once above the ground, a plenty of rain seems desirable and at the date of writing (July 22) the condition of the border offers promise of good results. The border this year includes 833 plants, representing 475 varieties. Among the new exhibitors are Wm. F. Jost of New Haven, Conn., and Wm. H. Waite of Rumson, N. J., who have contributed prize-winning novelties of 1921, and Dr. L. Hosford Abel of White Plains, New York, who won several first prizes in amateur classes at the annual exhibition of the American Dahlia Society held in New York last September. Mr. J. J. Broomall of Eagle Rock, California, has sent his best novelties for 1922 and Mr. Wm. J. Matheson of Huntington, N. Y., through his superintendent, Mr. James Kirby, has, as usual, been a most generous contributor.

Meteorology for May: The total precipitation for the month was 5.54 inches. The maximum temperatures recorded for each week were as follows: 81° on the 2nd, *88° on the 10th*, 82° on the 21st and *88° on the 26th*. The minimum temperatures were: *36° on the 1st*, 44° on the 13th, 46° on the 17th and 43° on the 28th.

Meteorology for June:—The total precipitation for the month was 8.43 inches. The maximum temperatures recorded for each week were as follows: *92° on the 11th*, 80° on the 12th, 85° on the 24th and 88½° on the30th. The minimum temperatures were: 63° on the 7th and on the 8th, *50° on the 13th*, 58° on the 24th, and 58° on the 27th.

Dr. E. van Slogteren, a plant pathologist of Lisse, Holland, visited the Garden on June 2. He represented the bulb growers of Holland at the recent conference in Washington where bulb diseases and restricted importation were discussed.

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Vol. XXIII September, 1922 No. 273

JOURNAL

OF

The New York Botanical Garden

EDITOR

R. S. WILLIAMS

Administrative Assistant

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

INTELLIGENCER PRINTING COMPANY

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In pinewoods near Saint Joseph's Bay, Florida.—A bush of the "Chapman-honeysuckle" as *Rhododendron Chapmanii* is locally known. This species is a true evergreen rhododendron. It is our only species growing in the southern Coastal Plain and at sea-level. It appears to be a relic of a former but late geologic period with different floristics, as are also its geographic associates, croomia, torreya, and Florida-yew.

JOURNAL
OF
The New York Botanical Garden

VOL. XXIII September, 1922 No. 273

THE BOTANICAL FOUNTAIN OF YOUTH

A RECORD OF EXPLORATION IN FLORIDA IN APRIL 1920

With Plates 275 and 276

Designated "Bimini" [1]—Land of the Fountain of Youth—by the aborigines of the West Indies in pre-Columbian times, it seems almost to the present day traveler in Florida as if the country had drunk of her own rejuvenating waters. She is old. She is young. A land to lure the expeditioner centuries ago, she is no less fascinating to the explorer and investigator today. She is still fruitful of things unrecorded. This is so, especially if the investigator happens to be a botanist. Much of her territory, botanically, is still terra incognita—as much so as when the Spaniards were still calling her not Bimini, but Salvagio[2] —Savage Land, so to speak. Old Ponce de Leon's name, Florida,[3] was a happy accident. For "Florida" she is, as if we would call her "the beflowered."

Even on the map the State has a romantic flavor. This is

[1] Name used by the West Indian natives to designate a land lying to the north of them—doubtless Florida—where a fountain, whose waters would confer perpetual youth, existed. After the discovery of the New World by Columbus, the Florida peninsula was marked Bimini on some of the early maps.

[2] More than half a century before the New World became known through the first voyage of Columbus, a map made by Battista Beccario in 1435, shows four islands—Antilla (Cuba), Reyella (Jamaica), Salvagio (Florida), and I in Mar (Bahamas). Doubtless some mariner, driven westward by storms, had sighted these parts of the Western Hemisphere early in the fifteenth century.

[3] So called by Ponce de Leon because he discovered the land on Easter—Pascua Florida of the Spanish.

furnished by her rich and varied nomenclature. Thus the original land-holders have passed on to us such "jaw-breakers" as Itchepuckesassa, or, better yet, the name of that other river, the Thlathtopopkahatchee. But, to even up, the names that were easy to the subsequent white man were, in turn, impossible to the red. This is evidenced, for example, by the celebrated river Suwanee, which is doubtless the best the tongue of the Florida native could do with the Spanish name of the river San Juan—later called the Little Saint John in order to distinguish it from the Saint John's River which empties into the Atlantic. No fewer than twenty Christian saints, with their titles prefixed, are commemorated in the geography of Florida. Others are represented with the titles omitted. And not only has theology thus contributed to the geography of Florida, but so has its predecessor, mythology. Jupiter, Juno, Neptune, Mars, Venus you will find them all.

These general observations were forcibly impressed on us during an itinerary of more than two thousand miles on land and over five hundred miles on water during the writer's exploration in Florida in April, 1920.

The two main magnets of this trip were middle Florida and peninsular Florida. Middle Florida, in a general way, is the part of northern Florida that lies between the Apalachicola River and the Suwanee. Peninsular Florida is the great tongue of land which extends southward and separates the Gulf of Mexico from the Atlantic Ocean.

Leaving New York at the end of March, we proceeded as directly as possible, and almost continuously, to Apalachicola.

Winter still held the north in its grip. The salt meadows near New York showed a few erect but frayed stalks of cat-tail (*Typha*) and reed (*Phragmites*). Most of the plants of the extensive patches lay prostrate as a result of successive ice-storms through the winter. The highlands were just as bare of green vegetation. All the trees looked about the same as they did in midwinter, except the elm (*Ulmus*), which appeared more plumose on account of the myriads of nascent buds. Not even was that usual harbinger of spring, the skunk-cabbage (*Spathyema*) in evidence.

The thorough work of the cold winter was particularly evident in the total lack of greenery as far south as Maryland. Even

the numerous well-kept lawns barely showed the advent of their green carpet. In the low woods, green being absent, the most conspicuous elements in the landscape were the pale-barked beech-trees and the dark-barked oaks.

The outlook for spring appeared more encouraging in Virginia. The red-birch, in the river-swamps, showed its bursting red buds, while precocious flowers of the red-maple exhibited both red and yellow just as they do in the woods at the Garden. The significance of two colors in the red-maple is a problem awaiting solution by someone.

The alder (*Alnus*) was blooming, but it was two months later than in this locality the preceding year. The rolling hills of Virginia clothed with pine were green, those wooded with deciduous-leaved trees were leafless. The pinelands and the hammocks of the Carolinas should have been gay with bright-colored flowers, yet those of herbaceous plants were almost nil. An occasional willow (*Salix*) showed its yellow aments and the yellow-jessamine adorned many bushes in the low hammocks with its pale gold bells. Conifers were blooming—the cypress (*Taxodium*) in the swamps, and the pines (*Pinus*) on the hillsides.

Georgia exhibited a little more advanced vegetable life. The plum family stood out prominently, represented by the wild-plum (*Prunus umbellata*) with white flowers, the semi-cultivated chicasaw-plum (*P. angustifolia*) and the cultivated peach (*Amygdalus Persica*) with different shades of pink. Hillsides were copiously decorated with the red-bud (*Cercis canadensis*), and in wet places pitcher-plants (*Sarracenia*), and in high grounds tansy-mustard (*Sophia*) flourished. Various oaks were in bloom. Their yellow and red aments and bright colored young leaves, together with the delicately colored foliage of the sweet-gum (*Liquidambar*) and black gums (*Nyssa*) were at one time finely silhouetted against the black-purple clouds of an approaching cyclone, in a most beautiful lacework.

The bark of the trees in southern Georgia and in northern Florida attracted our attention. It was almost universally gray, a sombre gray like that of the often accompanying Florida-moss (*Dendropogon*). They are not only gray, but rough. Now, in northern regions and in the tropics, southern Florida included, we find a variety of smooth, often highly colored barks—another

problem, as to the significance and reasons, still to be worked out.

Heavy rains in the uplands had changed the rivers into streams resembling ochre paint as they transported the products of erosion to the coast. Many miles of the soft-floored flood plains of rivers were submerged. The necessity of the buttressed trunks common to most of the hardwood trees in this region was evident. In the flood plain, even the trees of Elliott's pine (*Pinus Elliottii*) had buttressed trunks—a phenomenon we have never noticed elsewhere.

Northern Florida

Northern Florida was more suggestive of spring time and displayed an almost normal amount of green foliage. The cultivated pear trees were in bloom or just past flowering. The chokeberry (*Aronia*) and blackberries (*Rubus*) decorated the hammocks. The atamosco-lily (*Atomosco*) was conspicuous in the low pinelands.

In crossing northern Florida westward the Chinese wisteria (*Bradleia*) in full flower marked the sites of old homesteads. Both hammocks and the neighboring pinelands were aglow with the bright yellow jessamine (*Gelsemium*) and the delicate pink-flowered wild azalea (*Azalea canescens*). The high pinelands supported very numerous plants of a southern false-indigo (*Baptisia alba*) whose large leaves and tall, strict spikes of whitish flowers give quite a different impression from those of our northern false-indigo (*Baptisia tinctoria*). Vegetable parasites were not wanting, for many of the tall trees in the gum-ponds supported large clumps of mistletoe (*Phoradendron macrotomum*).

Some of the inhabitants of middle Florida showed their appreciation of the native flora to the extent of cultivating specimens of the needle-palm (*Rhaphidophyllum*) in their front yards.

Intermittent train-service delayed us for a day at River Junction at the head of the Apalachicola River. Reaching there in the middle of the night we stumbled into a hotel, not figuratively speaking, for there was neither star nor street-lamp to furnish light; yet we fared better than did Asa Gray, at the same place nearly fifty years ago, when on "A Pilgrimage to Torreya."[1]

[1] See American Agriculturist 262. 1885.

The following day which could have been used to advantage for exploration about River Junction, as long ago planned, was devoted to watching a steady and heavy rain, the edge of the storm that so seriously devastated parts of Georgia and Alabama on the same day.

That evening we set out for the Gulf coast with quite different feelings from those that would have been possible when Doctor Chapman, for over sixty years a resident of that part of Florida, wrote to Doctor Torrey from Quincy in 1840, as follows:

"You will recollect that I am on the frontier and the Indians hold undisturbed possession of the county between me and the Gulf. The Andromeda rhomboidialis and Rhododendron punctatum grow there, but it is as much as my neck is worth to venture down. Although parts of this county have been settled since 1825 yet no white person to my knowledge has ever traversed that unknown region, and you can imagine my anxiety to plant the standard of Flora in the midst of those wilds."

Two years later he wrote from Rocky Comfort near Quincy the following:

"Last summer I went down into the lower part of this county to get some of the Rhodendron punctatum. The whole country is a perfect wilderness where deep swamps and dry sand ridges alternate. I rode to one of the larger creeks and then took it on foot through a swamp nearly a mile wide. In this swamp I found a *moccasin track!* but as it did not appear recent I ventured on some five miles farther and to my great mortification I could not find the spot where I had seen it before. The next day some hunters on the frontier fell upon thirteen Indians three of whom they killed. It seems they had found *my trail* and were following it up towards the frontier!! I need not say to you that it was my last visit to that region.

"If I could in safety explore the uninhabited region towards the coast many rare and choice things could be brought to light. Your city botanists with polished boots, rolled to your favorite haunts in steamboats and cars have but a faint idea of the figure a Florida botanist cuts in these wild woods. I take a thick bundle of newspaper which I tie behind my saddle. When I fill these I pack into my saddle bags as long as there is room—then my *hat!* is brought into play as long as it will stay on my head. Lastly I strap a bundle as large as a sheaf of wheat on my back and then start for home on a large white horse. (My horse is nearly as good a botanist as I am.) With so much trouble in collecting plants and in a climate so sultry, northern

botanists should not complain if we place great value on our specimens."

We traversed the country between River Junction and Apalachicola by rail. Even at this late date there is no highway directly connecting Apalachicola and the north, and the only way to reach the town by wagon or by motor car is to go south from Marianna to Port Saint Joe, thence eastward to Apalachicola.

The woods of the irregularly eroded, often steep hills south of River Junction, were well covered with both foliage and flowers. There were tender hues of green almost equal in number to the different kinds of shrubs and trees, and they were all lively greens. The flowering-dogwood (*Cynoxylon*), scattered through the woods, was just coming into bloon. All over the hillsides were masses of the red-bud (*Cercis*) and a delicate-pink honeysuckle (*Azalea canescens*), a kind confined to the southern Coastal Plain and originally found in the Carolinas over a century ago. The streams meandering about the bases of the hills were lined with thickets of haw (*Crataegus*) and plums (*Prunus*), both with white flowers.

Swinging away from the river and the hills, we entered the flat country that formerly was pinewoods, but now is farming land. It was this region and similar ones both east and west of Apalachicola River that attracted planters from the Atlantic States over a century ago.[1] Here and there, there remained a dark screen of pines, but most of the former pine growth had long ago been cut away to make vast fields. What is there now may be second growth. The herbaceous flora was nearly if not just as scant as in winter. Only a few inconspicuous plants, such as the dwarf-dandelion (*Kregia*) and violets (*Viola*), were in evidence.

Apalachicola was reached in the night, and we were now near the main object of our excursion, namely, *Rhododendron Chapmanii*, the *Rhododendron punctatum* of the Chapman letters quoted on a preceding page.

The next morning we sought the cooperation of Miss Winifred Kimball, who was an associate of the discoverer of the *Rhododendron* in question. This secured, we found a "Ford" whose driver was willing to devote a day to botanical exploration and

[1] Journal of The New York Botanical Garden **21**: 164 and 165. 1920.

set out for Port Saint Joe, which lies twenty-odd miles west of Apalachicola on Saint Joseph's Bay. This body of water is unique in western Florida in that it has no feeders from the land. It is, consequently, devoid of oysters which abound in all the other bays, even in the adjacent ones.

Before we reached Port Saint Joe, a town of recent establishment, we stopped at the old site of Saint Joseph's, a town of considerable importance in the early part of the last century, but which was completely wiped off the map in 1841 after a series of storms and epidemics of cholera, small-pox, etc. Today not a chimney, wall, or plant of the place remains. The only evidence of its former existence are some circles made with bricks of a peculiar size and shape—probably imported—which were evidently laid around the bases of tree-trunks as was customary in old gardens.

Strange as it may seem, Saint Joseph's was the southern terminus of the second railroad operated in America. It extended from Wewahitchka to the Gulf. The operation of this railroad ceased decades ago, but the road-bed is there, just as good as it was many years ago.

At Saint Joseph's, that was, our party was reinforced by Mrs. George Patton, who is well acquainted with the surrounding wilderness. We left the main road and turned north on the bed of the old railroad. A mile northward we stopped at the burying grounds of Saint Joseph's. There lie the remains of the former inhabitants of the town. The most numerous burials, as far as the tombs show, took place in 1841 when the town ceased to exist. This cemetery is in the midst of the pinewoods, and nearby, the "Chapman-honeysuckle," as the *Rhododendron* is locally called, is known to have been recently growing in abundance. However, thorough search failed to reveal it. Forest fires had perhaps exterminated it in this region.

After continuing our search about two miles further north the object of our desire came into view, scattered here and there in the pinewoods.

Several cold spells during the late winter and a drought had worked to our advantage, and at a much later date than the usual flowering season, we found the shrub in full bloom!

Now, this shrub is not an *Azalea*, as the local English name would indicate, but it is a true *Rhododendron*, an evergreen

growing at sea-level near the Gulf Coast. Its nearest native relative grows in the Appalachian region where our rhododendrons naturally belong and are associated with hardwood forests and not with pine-barren formations. Aside from the interest caused by the plant itself, its presence there would seem to indicate that it is a remnant of a former and different general flora of that part of the country. The land doubtless once had a different elevation, different surface, different climate and a different flora from that now existing there. There are other plants in this part of Florida that also indicate just such a change. For example, we find torreya (*Tumion taxifolium*), Florida-yew (*Taxus floridana*), and croomia (*Croomia pauciflora*) —all endemic species—all genera now far separated from any closely related associates.

The "Chapman honeysuckle" is an ornamental shrub of the first order. The flowers are pink, often of a peach-blossom effect. Unfortunately the species is on the verge of extinction. It has doubtless been on the wane during late geologic times and the forest fires caused by the red man and by the white man are hastening the process of elimination.

Being an inhabitant of the pinelands and ordinarily a winter bloomer, this extraordinary shrub will no doubt thrive in southern Florida where in the season when such a plant is needed, we have heretofore been unable to secure one. Specimens have been transplanted to reservations in southern Florida and their behavior is being watched with much interest.

The more tempered climate of the Gulf region gave more of the aspect of spring there than existed in the country further back. The flowering shrubs of the pine-woods were the stiff blueberry (*Vaccinium Myrsinites*) and the pliable or half-vine fetter-bush (*Desmothamnus nitidus*), both with pink-flowers, and the low blackberry (*Rubus trivialis*) and the gallberry (*Ilex glabra*), which was in fruit as well as in flower. Herbaceous plants were more in evidence. There were butterworts (*Pinguicula*), milkworts (*Polygala*), spiderworts (*Tradescantia*), bladderworts (*Utricularia*), St. Petersworts (*Ascyrum*), blue-eyed grass (*Sisyrinchium*), and thistles (*Cirsium*).

The numerous hammocks were also floriferous. And there was one plant in the pinelands and one in the hammocks that eclipsed all other blooming things. The former was a herbaceous

On Pumpkin Key, Florida.—A giant gumbo-limbo tree (*Elaphrium Simaruba*) which marks about the center of the circular island. The remarkable buttressess are developed for the purpose of supporting the tree and for increasing the root system, for the tree is growing directly on the coral limestone. Different kinds of trees have developed different mechanical methods for resisting the blows of storms. The wild-tamarind and the mastic develop rigid buttresses like the gumbo-limbo, while the pigeon-plum for example, develops a tangled mass of

mint or labiate—*Conradina canescens*—which is confined to the Gulf Coast from Mobile Bay to Tampa Bay. It grows about a foot or eighteen inches tall and is usually to be found in dense, often extensive patches forming a sea of light blue flowers here and there among the other pineland vegetation.

But, the plant par excellence, in the springtime is the titi (*Cliftonia monophylla*), an evergreen shrub or small tree—sometimes called buckwheat-tree on account of the fruits which resemble buckwheat. In the number of individuals this vastly outranks its woody associates. It flowers before the new leaves are put forth, covering the swamps for mile after mile with countless myriads, not only of white flowers, but of flower-clusters, like banks and hills of snow.

Associated with the titi, but quite insignificant, is a southern willow (*Salix longipes*) seen here in flower by us for the first time. It gives quite a different impression from the willow of the lower part of the peninsula—*Salix amphibia*.

This part of Florida is a strange country where profound geologic changes have taken place in the past and where erosion is now active, both superterranean and subterranean. An excursion planned for the Dead Lakes had to be deferred for lack of time. This uncanny region comprises the section of the Chipola River where, sometime ago, the bottom fell out, and the region is still sinking. The trees that once stood on the river banks and in the neighboring swamps are being more and more submerged, some of them not only still standing up under the water, but still festooned with their streamers of Florida-moss (*Dendropogon*).

This whole vast country—for sixty years the home of Doctor A. W. Chapman, in his time the most active botanist of the South, is still practically unexplored botanically. During the first part of the last century it was held by hostile Indians and during the latter part it was inaccessible on account of the lack of highways and railroads. Yet, the small portion that Doctor Chapman did explore long ago yielded new genera and scores of new species, many of them of extraordinary relationships and interest.

With all this in mind we were loath to leave Apalachicola, but early in the morning after we had secured our prize, the Chapman honeysuckle, we embarked on the "Crescent City" for Carra-

belle, an old port which is situated about twenty-five miles east of Apalachicola on Saint George's Bay. Thence we went by rail to the eastern coast by way of Tallahassee and Jacksonville.

Carrabelle is built on some hills of "scrub" that extend to the waters of Saint George's Sound. There, as at Apalachicola, the proximity of the Gulf had forced spring in spite of opposition from the north. The spruce-pine (*Pinus clausa*) and scrub-oaks (*Quercus*), both marks of the "scrub," were present and in flower. More lowly plants—golden asters (*Chrysopsis*), butterworts (*Pinguicula*) and *Conradina* were plentiful, and titi was ever present in low situations.

Away from the coast extensive stretches of denuded lands came into view. The less elevated regions reminded us of the borders of the Everglades, especially when saw-grass (*Mariscus*), marshes, and hammocks were included in the landscapes, except that the hammocks in this case were on the lower grounds instead of on the higher, as they are in the Everglades.

Not all this region looked utterly forlorn. Some areas long ago deforested were being naturally reforested, with here a growth of pine trees and there a grove of oaks. The lower stretches were being forested more rapidly than the higher, apparently for the reason that they were naturally less frequently fire-swept.

The water in pools and ditches was often hidden by a copious growth of duckweed (*Lemna*), water-milfoil (*Myriophyllum*), and pipeworts (*Eriocaulon*). In striking contrast to the almost barren high pinelands were the stream-banks decorated with masses of wild-honeysuckle (*Azalea*) flowers, and the flood-plains, dotted with palm foliage, both that of the blue-stem (*Sabal minor*) and the saw-palmetto (*Serenoa repens*). The cabbage-tree (*Sabal Palmetto*), so characteristic of such situations in the peninsula, was wanting. This palm is rare in northern Florida and reaches its western limit of distribution at Saint Andrew's Bay, just west of where we found the "Chapman-honeysuckle." One would expect to find the cabbage-tree further west on the Gulf coast, just as it occurs further north on the Atlantic coast. However, the land is not situated so as to receive seeds brought northward by migratory birds from further south in the State, and the region is subject to more severe weather conditions in the winter. It is not until we reach

southern Texas that a cabbage-tree (*Sabal texana*) again appears on the Gulf coast.

Down the Eastern Coast

Just twenty-three hours after leaving Apalachicola on the Gulf coast, we entered Daytona on the Atlantic.

Here the "weed-wagon," as our car of exploration had come to be known along the trunk lines we frequently travel, was in waiting. Three hours' rest put us in condition to continue our journey and at seven o'clock we set out for the south.

However, before actually starting southward we crossed the Halifax River (Lagoon) to the coastal sand-dunes for further exploration in the strand-flora of that region.

The vegetation of the dunes in its rejuvenated costume was a brilliant green. The foliage of the dense, woody vegetation had never before looked so bright and massive to us. Shrubs and trees are all of about an equal height there. They all lean westward and have their tops worn away, as it were, by the continuous action of the wind, or are really abnormally developed with the growth exaggerated on the leeward side. The result resembles a miniature forest over which a mightly roller has passed crushing down the trees so that they are unable to grow upright again.

The spruce-pine (*Pinus clausa*) there and southward throughout the "scrub," having lost many of its mature leaves, perhaps as a result of the cool weather of the winter just passed, had put forth numerous shoots with young leaves, which gave the trees a striking likeness to the northern spruce-trees—whence the common name, spruce-pine.

As a result of excavations in the sand-dunes for building highways, we had a glimpse of the habits of the roots in that geologic formation. The pure sand of the dunes forms a ready drainage for the surface water and the numerous roots of all the plants, especially the woody ones, even of the smaller kinds, "go to great lengths," particularly on the higher dunes, to reach the water table.

These dunes, along with the entire strand flora of the eastern coast of Florida, should be made the subject of a special monograph at an early date. Large stretches of dune-formation, both at the north and at the south, have already been destroyed,

not only as to vegetation, but also topography. At the present rate of development the whole stretch of that unique strand will lose its original condition.

Driving through Daytona on our way southward, we were struck by three ideas, one of regret, the others of satisfaction. This town, founded in 1870, had originally been named for a settlement of the region between one and two centuries old: Tomoka; but through the selfishness or narrow-mindedness of some one the name had soon been changed to the less euphonious one it still bears.

But there are two points to be thankful for. As someone has said, "It is . . . built in a forest of oaks, palmettoes, and glossy magnolias, with all the charming features of a park reserve; the residences appear to be incidental to the park-like appearance, rather than the main feature." That is to say, the city authorities have left much of the original hammock standing in the streets and the yards, instead of crowding in a jumble of inappropriate shrubs and trees. Moreover, the residents have made use of many native plants for their landscaping, and particularly prominent is the native coontie (*Zamia umbrosa*), which is used as hedges, as borders for approaches, and as clumps on lawns. This plant is robust and healthy in nature, and cultivation augments both these good points. It is more appropriate there than are the coarser cultivated cycads (*Cycas*).

The hammocks on the shell mounds near Port Orange yielded another prickly-pear (*Opuntia*) not before found by us. This was a bushy plant with numerous deep-green, shining joints which were armed with pale, solitary or paired spines and bore rather slender fruits.

On the floor of the hammock in the dense shade, where in the winter the wild-pepper (*Peperomia cumulicola*) grows to the exclusion of almost every other herbaceous plant, we found an apparently new chickweed with very small starry white flowers. Mixed with it was the wild-pepper, but only the new stolons from the rootstocks of the last season were in evidence. There, however, were the nascent flowering stalks for the coming season —December.

We pushed on to New Smyrna, where we called on Professor H. C. Beardslee[1] and cared for specimens we collected in the

[1] Henry Curtis Beardslee was born 28 September 1865, at Painesville,

Apalachicola region. Then we continued southward, collecting along the way, as far as Cocoa. There we crossed the lagoon—Indian River—to Merritt's Island.

This island is one of the larger, if not the largest island in Florida. Its position, too, is unique. In the later geologic evolution of the peninsula this area was caught between three lagoons—the Indian River in the west, Mosquito Lagoon and Banana River on the east, or between the Indian River and the narrow islands that separate the two other lagoons from the Atlantic Ocean. The island ranges from ten miles to a stone's throw wide and is forty-odd miles in length. It has large level areas which naturally are grown up into pine woods, and long stretches along the water, particularly in the eastern side, or on both sides where the island is very narrow, whose vegetation has long had the tempering effects of the warm waters of the lagoons and protection from fire. Here we find very dense hammock. There seem to be no active sand-dunes there, but the "scrub" or old stationary dunes are extensive and strongly emphasized by their almost invariable indicator, the spruce-pine (*Pinus clausa*). The absence of active dunes may be accounted for by the protecting barrier between the Mosquito Lagoon and the Banana River. The velocity of the winds from the Atlantic has been reduced, the sands have been allowed to remain stationary, and vegetation consequently took firm hold. There is present there much the same ecological condition as we find on the coastal mainland along the eastern coast. However, the shrubs and trees typical of more southern regions, and doubtless carried northward along the coast by migratory birds, are more numerous and better developed than in most places on the mainland shore on account of the protection from cold from the west afforded by the Indian River.

Ohio. He is a son of the Henry Curtis Beardslee (1807–1884) who was the author of a "Catalogue of the plants of Ohio" (1874) and was a contributor to the early volumes of the Botanical Gazette. After graduation at Western Reserve University in 1889, he was for ten years teacher of science in the University at Cleveland, Ohio, and for twenty years senior master of the Asheville School in North Carolina. For many years he has been known as a collector of fungi, especially those of North Carolina and Ohio, and particularly the Agaricaceae. He has spent portions of recent years on the eastern coast of Florida studying fungi.—John Hendley Barnhart.

We are inclined to consider the southern elements of the hammock as originally sown there by birds, because the shrubs and trees which comprise the hammocks are berry-bearers and consequently furnish birds with food. Unimpeachable evidence of the northern distribution of plants with baccate fruits by migratory birds is recorded on a succeeding page.

Although not numerous, flowering herbaceous plants were in evidence. Two golden-rods (*Solidago*) were plentiful. Blue was conspicuous in the presence of lupine (*Lupinus*), vervain (*Verbena*), and spiderwort (*Tradescantia*). Drummond's evening-primrose (*Raimannia Drummondii*)[1] was extensively naturalized. But the most striking plant was the smallest, i.e. a little rattlebox (*Crotolaria*). In it the stems arise from a woody-fleshy root, which is buried deep in the sand, and spread out on the ground, particularly among the grass. The little pea-like yellow flowers are raised above the accompanying vegetation on stalks which are both slender and of such a color that they are quite invisible except on close inspection. Thus the flowers appear as yellow dots here and there or in patches, standing above the accompanying plants apparently unsupported.

The most noteworthy discovery on Merritt's Island was a columnar cactus—a kind of prickly-apple (*Harrisia*) apparently different from the others found in the State. The locality, too, is further north than those heretofore known on either the eastern or the western coast. The plants were growing on coquina along the Banana River. Heretofore we have found the species of *Harrisia* either terrestrial, growing in sand, or epiphytic and growing on various rough-barked trees. Never before have we found it growing on rock[2].

After we returned to the mainland and continued southward, rain storms became frequent. We consequently made all possible haste toward our ultimate destination, gathering, however, whatever specimens we could find along the way.

[1] Journal of The New York Botanical Garden **19**: 4. 1918.

[2] Habitat or environment in this case lack of nourishment and lack of light, made a profound difference in the habit of this cactus. It resembled a slender snake-cactus (*Silenicereus*) in habit more than a *Harrisia*. After two years of cultivation in the Deering cactus plantation at Buena Vista, Florida, under the same conditions as the other specimens of *Harrisia*, it gradually assumed the characteristic vegetative habit of that genus, and this year—May 1922—it produced flowers identical with those of *Harrisia fragrans* originally discovered near Fort Pierce, Florida.

Arriving at Miami we established our field headquarters in the laboratory building of the Plant Introduction Garden of the United States Department of Agriculture. Thence we made excursions far and near.

A Cruise to the Keys

In addition to Rhododendron and cactus, palms were one of our major objects—one palm of island distribution (*Pseudophoenix*) and one of the mainland (*Paurotis*).

Thirty-odd years ago, in 1886, a palm new to the flora of the United States was discovered on Elliott's Key and later in the same year on Long Key[2]. It was the hog-cabbage palm, so-called because the pith of the stems which abounds in sugar is used for feeding hogs in the West Indies. We visited both the islands in search of the palms in question. We had seen a single tree of the hog-cabbage palm on Elliott's Key abount twenty years ago. During this excursion with the cooperation of Mr. William Sommers, we saw two young plants and an old patriarch, perhaps hundreds of years old. For, judging from the state of development of seedling plants, the natural growth of this palm is exceptionally slow. The palm is apparently nearly extinct on this island. It was doubtless plentiful there not long ago, but methods of pineapple culture were not conducive to its growth or development. Successive clearing of the land by chopping and burning just about exterminated the palm and such good specimens as survived the ax and the fire-brand were removed and transplanted for ornamental effects at Miami and elsewhere.

From Elliott's Key we moved southwestward to Long Key, where a grove of about two hundred plants was observed when the palm was discovered there. Our search failed to reveal a single plant. The species there did not have the disastrous effects of cultivation to contend with, but when the natural supply of royal-palms (*Roystonea regia*) began to fail the palm peddlers, they fell back on the hog-cabbage palm and sold it far and near to the unsuspecting for the royal-palm. Thus the original grove on Long Key has been greatly depleted, if not exterminated.

We noticed places where the sand had been disturbed some time in the past. These were doubtless spots from which palms

[2] See Journal of The New York Botanical Garden **23**: 33 43. 1922.

had been removed. As late as December 1919, on upper Matecumbe Key, we found a plantation of young "royal-palms," really hog-cabbage palms, plants not long previously brought from Long Key.[1]

However, before pronouncing the species extinct in the hammocks of Long Key we will make another search for specimens at the earliest opportunity.

The demand for royal-palms seems to have been greater than the supply for some time past, for several years ago one or more cargoes of well grown trees of the hog-cabbage palm were brought from the Bahamas, where the plant is plentiful on some islands, and sold to the inhabitants of Miami for the royal-palm.

On the day of our arrival at Long Key we searched the hammock until dusk, when we moved the "Barbee" inside and selected a safe anchorage back of the lower end of Lower Matecumbe Key. We had noticed extensive meteorologic disturbances on the horizon during the afternoon and after sunset there was much lightning in the distance. Not thinking of any serious trouble in the night we retired early. Everything, evidently, went well until almost exactly midnight, when a terrific "norther" broke upon us. The sea which a moment before was smooth began to roll over and under us. The wind came in long puffs, which grew into a steady gale. Loose objects were swirled away. The anchor began to drag. We were driving toward the shore. The world was inky black, except when the lightning flashed. And then -the anchor held! Just as it ceased to drag, the lightning revealed a few yards to the west of where we lay, groups of ragged piling left from the construction operations of the Key West Extension of the Florida East Coast Railway. If the wind had shifted a point to the east, this chapter, if ever written, could have been headed "shipwrecked."

The "norther" was followed by about twenty-four hours of rain and electric storms, all of which defeated our plans for exploring the most elevated islands of the Florida Reef—Umbrella Key and Plantation Key.

As the day continued stormy, we moved northeastward as far as Pumpkin Key and in the lee of it we anchored for the night. The following forenoon was devoted to hammocks of

[1] Journal of The New York Botanical Garden **22**: 214. 1921.

Pumpkin Key. There the form of prickly-apple, so far as we now know, confined to that island, was just beginning to flower.

The center of this almost circular key is marked by an immense gumbo-limbo (*Elaphrium Simaruba*) tree with a remarkably buttressed trunk which we succeeded in photographing. Near it we found a natural graft of two pigeon-plum (*Coccolobis laurifolia*) trees. This tree seems to have the habit of making natural grafts, for an extraordinary case was observed on Royal Palm Hammock a few months previous. We had the satisfaction, too, of adding another terrestrial orchid to the flora of the reef—a humus plant, *Beadlea cranichoides*. We are gradually—very gradually, however—increasing the known orchid flora of the Florida Keys, but it is apparently scant. There are between forty and fifty orchids known on the nearby mainland, whereas there have been found about a dozen thus far on the islands of the reef. Later in the day we returned to Buena Vista, having been successful in our quest for palms on Elliott's Key but defeated on Long Key.

(*To be continued.*)

AUTUMN LECTURES, 1922

The following illustrated lectures will be delivered in the lecture hall of the museum building on Saturday and Sunday afternoons at four o'clock during September and a part of October. These will be followed by four lectures on Saturday afternoons at 3:15 o'clock in conservatory range 2.

Sept. 2. "The Method of Seed Dispersal" . Dr. H. A. Gleason
Sept. 3. "Passing of Our Native Flora" . Mr. Norman Taylor
Sept. 9. "The Results of Seed Dispersal" . Dr. H. A. Gleason
Sept. 10. "Botanical Travels in Mexico—I". Dr. W. A. Murrill
Sept. 16. "Some Greenhouse Plants as they Occur in Nature" Dr. H. H. Rusby
Sept. 17. "Useful Birds in Our Gardens and Orchards" Mr. Hugh Findlay
Sept. 23. "Dahlias and their Culture" . . . Dr. M. A. Howe
(Exhibition of Dahlias, Sept. 23 and 24)
Sept. 24. "Wild Flowers and Their Insect Visitors" Prof. O. P. Medsger

Sept. 30. "Botanical Travels in Mexico—II". Dr. W. A. Murrill
Oct. 1. "The Forest and the Paper Industry"
Dr. H. P. Baker
Oct. 7. "Historic Gardens".. ....Prof. J. W. Harshberger
Oct. 8. "Botanical Travels in Sweden"..Dr. W. A. Murrill
Oct. 14. "Some Plants Having Attractive Fruits"
Mr. K. R. Boynton
Oct. 15. "The Newer Knowledge of Food Values"
Prof. H. C. Sherman

The museum building is reached by the Harlem Division of the New York Central and Hudson River Railroad to Botanical Garden station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the subway change to the elevated railway at 149th Street and Third Avenue. Those coming by the New York, Westchester and Boston Railway change at 180th Street for crosstown trolley, transferring north at Third Avenue.

Greenhouse Lectures

Free public lectures will be delivered in the central display greenhouse, conservatory range 2, Saturday afternoons at 3:15, as follows:

Oct. 21. "Some Interesting Medicinal Plants of South America" .. .. .Dr. H. H. Rusby
Oct. 28. "Plants That Have Figured Prominently in the History of Botany".. ... ... .Dr. W. A. Murrill
Nov. 4. "Australian and New Zealand Plants Adapted to Cool Greenhouses"... .....Mr. K. R. Boynton
Nov. 11. "Spring-flowering Bulbs and How to Force Them for the Home" ... .Dr. M. A. Howe

Conservatory range 2 is situated at the eastern side of the Botanical Garden, north of the Allerton Avenue entrance. It is most conveniently reached from the Allerton Avenue station on the White Plains Extension of the subway from East 180th Street. Visitors coming by train to Botanical Garden station should inquire at the museum building.

NOTES, NEWS AND COMMENT

Meteorology for July: The total precipitation for the month was 7.09 inches. The maximum temperatures recorded for each week were as follows: 86° on the 8th, *92° on the 13th, 92° on the 18th* and 88° on the 24th. The minimum temperatures were: *57° on the 6th*, 58° on the 15th, 61° on the 21st and *57° on the 30th*.

The small wooden bridge across the Bronx River in the upper part of the Garden, which became quite dilapidated this spring after a considerable period of usefulness, has been rebuilt with red cedar poles and presents a rather more attractive appearance than before. Artists who feared the old structure would shortly be replaced by a modern stone affair will still find an agreeable subject for their skill.

Dr. E. van Slogteren, a plant pathologist of Lisse, Holland, visited the Garden on June 2. He represented the bulb growers of Holland at the recent conference in Washington where bulb diseases and restricted importation were discussed.

The New York Botanical Garden, in cooperation with the Horticultural Society of New York, held an exhibition of gladiolus in the museum building on Saturday and Sunday, August 19th and 20th, from 10 A.M. till 5 P.M. There was a beautiful display of these popular flowers in many varieties. At the time of the show many of the visitors also inspected the Garden plantation of gladiolus at the horticultural grounds where some 200 varieties were in bloom.

Dr. Kilpatrick's class in nature-gardening inspected portions of the grounds on June 3 under the guidance of a member of the staff. The members were especially interested in the new rock garden and iris garden.

Prof. John W. Harshberger with a class of thirteen students in botany, from Cold Spring Harbor, paid the Garden a visit on July 7.

Dr. A. B. Stout of the Garden staff spent the latter part of

July at Presque Isle, Maine, continuing studies on seed sterility of varieties of the Irish potato in cooperation with the Bureau of Plant Industry.

The annual visit of students of the summer session of Columbia University was made August 3. The party inspected the museum, conservatories, flower gardens, and natural forest under the guidance of members of the Garden staff.

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6. Privileges of the Board Room.

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Annual members may become Life Members by the payment of a fee of $250.00

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Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

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I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....

Vol. XXIII October, 1922 No. 274

JOURNAL

OF

The New York Botanical Garden

EDITOR

R. S. WILLIAMS

Administrative Assistant

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

INTELLIGENCER PRINTING COMPANY

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GREAT LAUREL

Rhododendron Maximum L

COCKAYNE, BOSTON

JOURNAL
OF
The New York Botanical Garden

VOL. XXIII October, 1922 No. 274

WILD FLOWERS NEEDING PROTECTION[1]

14. Great Laurel or Rose Bay (*Rhododendron maximum* L.)

(*With plate 277*)

This is the tallest of our native rhododendrons, as its specific name implies. Its generic name refers to the rose-color of the flowers and the tree-like habit of many of the species, which, though usually shrubby, sometimes attain a height of 20 to 40 feet in this country and in China reach 50 feet and constitute large areas of the forest, mixed with wonderful groves of *Magnolia*. Some of these new Chinese species have yellow flowers, thus adding a new color series in this already wonderful genus, and making possible an entirely new series of hybrids, perhaps as varied and beautiful as those of the yellow *Azalea*, which by many students is classed with the *Rhododendron*.

The rose bay is native only in eastern North America, ranging from Nova Scotia and Ontario, southward along the Alleghanies to Georgia, often growing in dense impenetrable thickets,in wet woods and in shady ravines, being particularly abundant in the mountains of Pennsylvania and Virginia. Its southern relative, *R. Catawbiense*, is abundant on Roan Mt., N. C., and gives its name to that summit, from the deep purplish-pink color of its flowers. Both these species grow readily from seed and hybridize freely having been the source of many showy cultivated varieties which are replacing their parents in gardens. Still, car-loads are often shipped to dealers from the southern states, and their valuable wood and decorative masses of ever-

[1] Illustrated by the aid of the Stokes Fund for the Preservation of Nativ plants.

green foliage render them still more liable to depredation in all unprotected localities where they grow wild. Their showy trusses of flowers open from June to July, maturing their anthers before their stigmas, and bending them upward, so that any insect visiting the flower for its nectar will be dusted by the pollen. By this means cross fertilization is accomplished. One of the lobes of the corolla is spotted and the necter is secreted at the base of the lobe, so that the markings are recognized as insect-guides. In this way many natural variations have been produced. About 350 species of *Rhododendron* are known to occur in the colder temperate regions of the northern hemisphere, 16 of which, if we include the *Azalea*, have been described from North America. All prefer a sour soil and leafmold and should be heavily mulched with rotten leaves, as they detest raw manure. They also like a cool, moist climate and partial shade when they attain their best growth.

A beautiful illustrated book on the *Rhododendron* by J. G. Millais has recently been published in England, and some of the colored illustrations of English gardens show the perfection to which these shrubs attain in that moist temperate climate. Many beautiful species and showy hybrids are described and figured in colors, which have originated either from crossing the Indian (*R. arboreum*) and the North American species or are 2d or 3rd crosses whose records have been lost. Species from Java and those recently discovered from China promise still greater choice of color and form for the future. Some few of the species are epiphytic and still others in the alpine regions of Western China are dwarfs and take the place of heaths in other countries. Still others are too tender to be grown except in green-houses. Some few of the evergreen species are fragrant and most of the azaleas have this added charm. Perhaps the new restrictions against importing these beautiful plants may encourage our own students and horticulturists to try experiments in crossing, which will add new treasures to this already rich and sumptuous genus. The accompanying illustration is of a plant grown at the New York Botanical Garden.

E. G. BRITTON

THE BOTANICAL FOUNTAIN OF YOUTH

A Record of Exploration in Florida in April 1920

(Continued, with plates 278 and 279)

A Detour Across the Peninsula

About one year after the hog-cabbage palm was discovered on the eastern coast of Florida, another palm new to the flora of the United States was discovered on the western coast. This, the so-called saw-cabbage palm, held the key to some points in morphologic structure and geographic distribution. It was this palm we determined to seek and solve the problem involved.

In traveling north from Miami to Jupiter there was little in bloom owing to the dampening effects of the cool spells of the preceding winter. The cool weather evidently had caused many of the spruce-pine trees to lose their mature leaves, and the partly grown new leaves gave the trees more the aspect of the true spruce than we had ever before noticed. Low fields recently abandoned or long neglected were great natural nurseries of ragweed (*Ambrosia*) and careless (*Acnida*), propagating their kind by the dispersal of their numerous seeds.

The purple panicles of the hound's-tongue (*Trilisa*), so conspicuous in Hungry Land in the winter, were now replaced by another purple-flowered plant, the thistle (*Cirsium*).

The numerous ponds were filled with three aquatic herbs, the spatter-dock (*Nymphaea*), the water-lily (*Castalia*) and the floating-heart (*Nymphoides*)—the latter furnishing, in habit, a perfect miniature of the *Castalia*—while about the edges the pale-yellow bracts and spikes of the aquatic queen's-root (*Stillingia*) grew in solid borders.

In the lower pine woods there were purple flowers in addition to the thistle—pine-hyacinth (*Viorna*), marsh-pink (*Sabbatia*), and prairie-pink (*Lygodesmia*). But yellow flowers were in the preponderance, in kind as well as in number. There were yellow-eyed grass (*Xyris*), alum-root (*Aletris*), milk-wort (*Polygala*), St. John's-wort (*Hypericum*), St. Peter's-wort (*Ascyrum*), bladderwort (*Utricularia*), tickseed (*Coreopsis*), and sneezeweed (*Helenium*). Pink was the color of the flowers of the two shrubs then blooming in the higher pinelands, namely, the fetter-bush (*Des-*

mothamnus) and the more conspicuous tar-flower or flycatcher (*Befaria*), a shrub worthy of cultivation, for both as an ornamental and cut as a flower it is of the first order. It is the only representative of the genus outside of Mexico, Central America and northern South America. Occasional clumps of cocoa-plum (*Chrysobalanus pellocarpus*) extended the known geographic distribution of this species many miles northward.

Our approach to the Hungry Land[1] slough which in the western boundary of that desolate and uninhabited region lying west of Jupiter, was indicated by the increasing number of willow-heads in the low pinelands and small prairie-like areas.

At the slough we learned that two bridges in the Allapattah Flats had been washed away by recent storms. We left the region of the pond-cypress (*Taxodium ascendens*) in Hungry Land and passed into the region of the river-cypress (*T. distichum*) in the Allapattah Flats. There the water-lettuce (*Pistia*), which seems to be absent from Hungry Land, filled the ditches which were lined with both species of cat-tail.

After meandering many miles over the old serpentine trail made by Colonel A. J. Smith during the Seminole Wars, we came to the first wrecked bridge. As it was a matter of either crossing the stream or turning back, we crossed without the bridge, and did likewise in the case of the second missing bridge. As we emerged onto the Okeechobee prairie we found most of it afire. In some places the fire was spectacular even in the daytime. Large clumps of the prairie-grass (*Spartina Bakeri*), which varied from three to six feet in diameter and were six feet tall, igniting singly and in groups, appeared as giant torches all over the prairie.

The fire had not at this time reached the hammock on the shore of Lake Okeechobee, but it had on other occasions. The standing and fallen giant trees and the tall cypress knees with the humus burned away from beneath them furnished ghastly evidences of this effect.

The guava (*Psidium*) is thoroughly naturalized in the old and new clearings of this lake hammock and in some places the shrubs and small trees form almost impenetrable thickets. The southern-elder (*Sambucus*)—a veritable weed in some parts

[1] See Journal of the New York Botanical Garden **22**: 56. 1921.

of southern Florida—is taking possession of large areas in the burned hammock, and it might even be considered a "fire-weed." However, whether considered a weed or not, it is a beautiful plant and bears a profusion of white flowers and purple-black fruits the year round.

We reached Okeechobee City in time to spend the night there; then we pushed on at dawn, across the Kissimmee River, and so to the Indian Prairie.

At the eastern edge of this region we had planned to take a trail leading to the southwest and to Venus. However, the eastern part of the prairie was, to a great extent, under water and we missed the trail. We continued southward many miles before we found another trail leading westward.

Spring had come to the prairies. On the higher ground many plants were in bloom. Some of the kinds seemed to be gregarious. Here would be a large white patch of pipewort (*Eriocaulon lineare*) and there a patch of yellow-eyed grass (*Xyris ambigua*). Sometimes the trail would be the dividing line, so that on the left the ground would be blue with lobelia (*Lobelia Feayi*), while on the right the numerous purple flowers of the false pimpernel (*Ilysanthes grandiflora*) would almost hide the ground. Wet depressions would frequently be creamy with an abundance of the hedge-hyssop (*Gratiola ramosior*).

When finally Venus was overtaken we found she had become twins—one on the old trail and another on the lately extended railroad. But our immediate objective in the neighborhood was an ancient burial mound of the aborigines, and here we made a collection of all the plants then in flower on the mound. These made a total of sixteen kinds, ranging from grasses to thistles. All were herbaceous plants, except a pawpaw (*Asimina reticulata*). The herbaceous plants are those kinds that have numerous roots or large tap-roots and they are thus able to perform their seasonal routine in spite of droughts.

There were more kinds of plants on the mound than in the pineland in its immediate neighborhood. This condition obtains almost invariably where the soil has been disturbed. Of course, it is perhaps centuries since the earth of the mound was stirred by the aborigines, but archaeologists have made excavations there within the present generation.

Having accomplished our work here, we next tacked back

in the direction of the colony of Palmdale, through open pinewoods and prairies. The enticing hammocks bordering Fisheating Creek were visible on the horizon toward the west. They were doubly conspicuous on account of the high greens of the new foliage.

The most striking phenomenon along the trail itself was the great tresses of Florida moss (*Dendropogon*) borne on the pine trees in the vicinity of the prairies. On the prairies two low shrubs of very distantly related plant families grew scattered here and there—they are the widely distributed heath fetterbush (*Desmothamnus*) with small pink honey-scented flowers and a pawpaw (*Asimina*) with large white liquorice-scented flowers.

We crossed Fisheating Creek near Palmdale. The water of the stream was then completely hidden by a growth of water-hyacinth (*Piaropus*) that had developed in less than a year's time, for when we last crossed there the stream was free of any visible plant growth.

The sun was now setting, and hastening on to Fort Myers we rolled into that town shortly before midnight, in time to slip into a restaurant for supper just before it closed.

The early morning following found us on our way to Marco Island, which is fifty-odd miles south of Fort Myers. It was a monotonous ride as far as Naples with scarcely a plant in bloom to enliven the landscape. The "scrub" and all land north of Naples was like a desert. However, when we entered the country back of the northern extension of the Ten Thousand Islands there was more evidence of blooming things, both terrestrial and epiphytic. An orchid, a grass-pink (*Limodorum*) showed its bright rose-purple spikes above the dense lawn of the low pinewoods. White-heliotropes (*Heliotropium polyphyllum*) and a pink asteroid (*Boltonia diffusa*) filled the numerous shallow depressions. The southern cypress trees were brilliant with air-plants (*Tillandsia*), with scarlet bracts, and with the butterfly-orchid (*Cyrtopodium*), with its large panicles of red-brown flowers.

We found a barge to take us across the inlet which separates Marco Island from the mainland. Once on the island we set out for the settlement of Caxambas—Spanish meaning wells or springs. The settlement is situated on Caxambas Island

about midway between the settlement of Marco, by land, and Cape Romano by water. The cape is a point of much interest botanically, but as yet it it little known.

The settlement of Marco at the northern end of Marco Island is built on a flat shell heap, not, apparently, however, made by the aborigines, but by modern clam-diggers who have filled in a mangrove swamp with the shells from a canning factory. The site is flat and only slightly elevated above high tide. The trail to Caxambas first passes through mangrove swamps which are copiously supplied with prickly-pears (*Opuntia*) and dildoe (*Acanthocereus*), both of which thrive in the high tide. After the swamps it follows the contours of low sand hills and runs through a plain-like region in the middle of the island where we were surprised to find a large area of "scrub" with at least its larger characteristic shrubs. The rosemary (*Ceratiola*) gave off its heath-like aroma and was just about the same shade of green as its almost invariable associate, the spruce-pine (*Pinus clausa*).

One surprise after another confronted us. One of the major ones was the several ranges of immense rolling sand-dunes comprising Caxambas Island on some of which the settlement of Caxambas is located. And hereabouts there are shell-middens of the aborigines, as well as shell deposits from the industries of the moderns. For ages man has raided the shell-fish here and the supply is still unexhausted. The large sand-dunes were most attractive collecting grounds. The hills nearer the water were clothed with hammock which was made almost impenetrable by entanglements of prickly-pear and dildoe, as well as by scraggly armed shrubs, all of which were laced together in the course of their growth. But the heath-like areas away from the sea, comprising the top, slopes, and valleys of the sand-dunes, supported a unique plant association. Woody plants that are naturally large were small, while shrubs that are usually small and inconspicuous were large.

The gopher-apple (*Geobalanus*) was particularly well developed and extensively distributed by its underground stems. This shrub, commonly about six inches tall, there grew up to several feet and formed pygmy forests many rods in extent. It was then in flower. The fruits must furnish a large and welcome supply of food for the native animals of the island.

Aside from these miniature forests of gopher-apple, there

were three conspicuous ground covers. Two of them were vines, the one a muscadine grape (*Muscadinea*), the other a catbrier (*Smilax*). Both attained an unusually luxuriant development and covered large areas of the dunes to the exclusion of nearly all other vegetation. The other ground-cover was a prickly-pear, a species of uncertain relationship. The growth of this cactus, too, was exceptional. The quantities and the luxuriance would almost put that of the deserts of Arizona to shame. The plants were in full flower. The masses of bloom, together with the flowers of a partridge-pea (*Chamaecrista*) showed as veritable yellow banks and lakes in all direction.

Our field work was cut short by an approaching storm—another like that which nearly wrecked us but a week before, and we reached Marco just as it broke. For a time it seemed as if the wind would blow the settlement off the island.

Morning, and we crossed to the mainland for an attempt to reach the Royal Palm Hammocks by land. A little experience with the trail leading to the hammock, however, convinced us that it was impracticable. The heavy rains of the recent storm had flooded the low woods or softened the mud to such an extent that our car could not make progress. Thus stalled in the low pinewoods and cypress heads we satisfied ourselves with collecting the plants then in bloom and then labored back to Fort Myers.

Here we stopped long enough for lunch and then set out for the valley of the Pease River. We went up the Caloosahatchee valley to Olga and there crossed the river and then the divide between the valley of the Caloosahatchee and the Pease River. It is a divide in reality, for some tributary streams flow one way into the Caloosahatchee and some the other direction into the Pease. However, otherwise it could be recognized only by actual leveling. The country is made up of a series of areas of low scrub, prairies, pinelands, and ponds. No part of the region seems higher than another.

Finally the old settlement of Punta Gorda[1] was reached.

[1] Punta Gorda was definitely settled about forty years ago, by a Kentuckian, a Colonel Trabul. The settlement was first called Trabul, but when a post office was established there it was changed to Punta Gorda which in English signifies broad point, referring evidently, to the cape-like projection of land where the estuary of Pease River and Charlotte Harbor meet.

On Indian Prairie west of Lake Okeechobee.—An Indian village in a cabbage-tree hammock. In these natural shelters the Seminole resides and farms. The structures he inhabits are built mostly of the cabbage-tree (*Sabal Palmetto*) which he calls Chaw-fo-ka-naw. The trunks furnish the structural material and fuel, and the leaves the thatch. The soil, unlike that of the surrounding prairie, is fertile, and in clearings, fenced in by the palm trunks

This town is situated on the estuary of the Pease River. It was settled long ago. Its relative antiquity is evidenced by the old camphor-trees, red-cedars, and silk-oaks once planted there.

We had traveled northwestward from the Caloosahatchee valley and at Punta Gorda we turned northeastward up the Pease River valley. The first tributary stream we crossed was Prairie Creek. This stream is well named, for, instead of being flanked by pinewoods or hammocks, it meanders through extensive prairie-marshes. Fort Ogden, another old settlement, was the largest town encountered on the way up to Arcadia. Its antiquity is indicated by the now large spreading live-oaks and tall giant eucalyptus trees, planted in the streets and yards many years ago. Thence we traversed prairies, pinelands, and hammocks which comprised trees characteristic of temperate climes—willows, wax-myrtle, sugar-berry, sweet-bay, maple, red-bay, and dog-wood. More unusual were the numerous small hammocks composed of an arborescent form of the button-bush (*Cephalanthus*). The banks on streams furnished us with ripe blackberries on trailing vines.

Many kinds of birds, both small and large, were in evidence on this leg of our route. The most impressive kind was the turkey-vulture which was nearly everywhere in large flocks. No turkey-buzzards, which are more common in most parts of the State, were visible.

After a night at Arcadia we continued up the Pease River. There the turkey-oak (*Quercus Catesbaei*) appeared on the hills, while the pines still forested the flat lands. In some places south of Zolfo Springs, the Florida-moss (*Dendropogon*) draped the pine trees just as we had found it near Fisheating Creek several days previous. There, too, the sand-blackberry (*Rubus cuneifolius*) appeared in the flora and bore much ripe fruit.

Turning eastward at Zolfo Springs we traversed low pinelands and crossed streams with hammock-clad banks, where, also, in several places we found groves of the saw-palmetto (*Serenoa*) with erect tall stems instead of prostrate ones. The pinewoods were quite barren. Contrasted sharply with their vegetation was that of the hammocks in which the new and copious foliage was twined with several kinds of shrubs and trees in flower.

A few miles west of Avon Park there is an abrupt change in

the topography of the land, and also in the vegetation. Where there had been little to attract the observer toward the west, here thickets of dwarf persimmons (*Diospyros*), clumps of pawpaws (*Asimina*), with large floppy white flowers, milkweeds (*Asclepias*), with bright-red flowers, prickly-pears (*Opuntia*), with bright yellow flowers, and lupines (*Lupinus*) with sky-blue flowers suddenly attracted our attention.

At Avon Park we turned north and drove to a settlement with the enticing name of Frost Proof. Outside of Avon Park we traveled through high pineland and then several low ridges of "scrub" largely covered with a stunted growth of two oaks—turkey-oak (*Quercus Catesbaei*) and high-ground willow-oak (*Q. brevifolia*). Here the open country and the bright sun, with its regenerating powers increased by the bare white sand, had conspired to bring spring to a climax. Herbs and shrubs were in bloom everywhere.

Not fewer than twenty-odd kinds of herbaceous plants could be gathered within the area of a square rod, and associated with them were about half as many woody plants.

The large-flowered pawpaw was the show-plant of the season. The many stems of the bushes, with their half-grown leaves, were usually almost hidden by the long wands of white or creamy-white blossoms.

The least conspicuous shrub was pygmy hawthorn or white-haw (*Crataegus*). It is one of those shrubs of which there are many in sandy, commonly fire-swept regions that for self-preservation have buried their main stems underground. This shrub was only about a foot tall, but it was neither in flower nor in fruit.

The woody plants in flower and most in evidence, aside from the pawpaw, were a variety of heaths, a huckleberry (*Gaylussacia hirtella*) with few, bell-shaped white flowers, a blueberry (*Vaccinium Myrsinites*) with numerous urn-shaped flowers, the tar-flower (*Befaria racemosa*) with large really handsome starry light-pink flowers, and fetterbush (*Desmothamnus nitidus*), often half vine-like, with bright-pink urn-shaped flowers.

Two herbaceous plants, purely American types, growing both in the pinelands and in the "scrub," represented the eastern edge of the geographic ranges of two genera whose center of distribution lies far west of the Mississippi Valley. These

apparently belong to rather closely related plant families. The one was an amaranth relative (*Froelichia floridana*) with tall wand-like pliable stems and small cottony inflorescences, and the other an umbrella–plant (*Eriogonum tomentosum*), a knot-weed or buckwheat relative. It is a stocky herb with a flat-topped inflorescence composed of many white or creamy flowers. Curiously enough this species is the type of the genus, the first one found or at least the first named. Although comparatively sparsely represented in eastern North America, there are hundreds of kinds of *Eriogonum* in the West.

Our plans for a reconnaissance southward of Avon Park had to be deferred for another year. That country is different from the territory to the north. Perhaps it is more interesting, perhaps less. However, judging from its position and topography it doubtless has something in store to engage our attention.

From Avon Park we hastened over to Sebring and on the way discovered additional localities for some of the new and rare plants previously discovered in that region. Visits to that unique region at times of the year we have failed to traverse it, would doubtless yield additional novelties.

Speaking in terms of altitude and longitude, at Avon Park we ascended the western slope of a broad sand plateau and at Sebring we descended the eastern slope. The descent consists, so to speak, of bounding over several parallel ridges clothed with a highly specialized vegetation and landing at the bottom of the last eastward ridge in the flatwoods with their rather commonplace vegetation.

A short survey on one of the sand-ridges of the eastern slope brought us unexpected results. The bushes of the scrub-plum (*Prunus geniculata*), the smallest and rarest plum of the southeast, were laden with fruits. Although the fruit was not quite ripe, the branches of some of the bushes were borne to the ground by the weight of the numerous drupes.

A grape vine, not recognized as one of the known species, grew almost everywhere over other shrubs. One of our rare milkworts (*Polygala Lewtonii*) was the showy herb on the snow-white sands. This plant grows in dense tufts, sometimes with as many as fifty stems. The lower part of each stem is densely clothed with bright-green fleshy club-shaped leaves, while the upper part is dense inflorescence with bright rose-purple flowers,

parts of which are tipped with yellow. Only part of the plant, however, is above the surface of the sand. Hidden in the loose sand, in addition to the roots, are numerous colorless stems which often rival the superterranean stems in length—sometimes they are thrice as long. On these, instead of long leaves, we find small scales and instead of bright flowers there are inconspicuous flowers with abortive floral envelopes, but with well-developed essential organs producing seed-bearing fruits.

Perhaps the most noteworthy discovery there was a new kind of fringe-tree or old-man's beard (*Chionanthus*). Two species of *Chionanthus* have been known for a long time. One, a large shrub or small tree, is native in the southeastern United States, and is much cultivated for ornament. The other is a native of China and is also in cultivation. Our new kind grew in miniature forests, the little trees ranging mostly from a foot to a foot and a half tall. Fortunately, we found the plant in full flower. The leaves were only partly developed, so that the myriads of pure white flowers borne in large panicles on the upper part of the stems were the most conspicuous floral feature on the hills.

The stream which marks the eastern edge of the sandhills was bordered with dense thickets of dogwood (*Svida*) and blackberries (*Rubus*) in bloom. Thence a long stretch of pinewoods with only a few inconspicuous plants in bloom finally gave place, eastward, to the Istokpoga Prairie.

The vegetation of the prairie had fully recovered from the fires that were raging on it the last time we crossed (May 1909) and cattle were grazing nearly everywhere. The virgin hammock surrounding Lake Istokpoga was plainly visible toward the west as we passed between it and the Kissimmee River. Our plans for exploring it have thus far been frustrated. The most striking phenomenon near the edges of the prairie was the lively green of the new foliage of the almost endless saw-palmetto (*Serenoa serrulata*) as contrasted with the somber green of the pines flanking the woods.

The sun set before we crossed the Kissimmee, so further collecting of specimens ceased. We pushed on to Okeechobee City, twenty miles distant, and then on to Fort Pierce, about forty miles further, where we arrived shortly before midnight.

Early the following morning we set out southward for Miami.

The forenoon, however, was devoted to the region about Rio and to the Herman hammock, where we searched in vain, for wild plants of *Opuntia leucotricha*, a cactus native in Mexico, that was naturalized there nearly a century ago. Although we had failed in our search, we secured specimens from plants growing in Mr. L. H. Toussaint's garden, found wild in the hammock several years ago.

The Florida toad-flax (*Linaria floridana*) which covers the white hills with countless flecks of blue in season was just passing out of flower. Naturalized weeds were present, of course. The most ubiquitous were two kinds of paint-brush, *Emelia sonchifolia*, with small slender heads of pink or bluish-pink flowers about equaling the involucre, and *Emelia coccinea*, with large stout heads of orange or crimson flowers that much exceed the involucre. Both of these are thought to have originated in southern Asia, but they are now found everywhere in the tropics.

Upon our return to Miami, a day or two was devoted to studies in the reservation of Mr. Charles Deering at Buena Vista, especially among the plants we had formerly introduced from other parts of the state and also in the cactus plantation.

A specimen of an orchid, which was without flowers when we collected it in the Cape Sable region several years ago, flowered for the first time and proved to be *Oncidium carthageniense*, new to the flora of the United States. It was first found in northern South America. It also grows in Central America and in Mexico. The leaves of this plant are thick leathery structures a foot or two long and the inflorescence is a slender-stalked panicle six to eight feet long, bearing many flowers mottled or tinged with brown, magenta, and yellow. Its discovery makes the fourth species of *Oncidium* for Florida.

Many observations were made among the cacti. All the specimens of the prickly-apples (*Harrisia*), introduced the year before, flowered, as well as the various kinds of prickly-pears (*Opuntia*), and valuable observations were recorded for future use.

The most noteworthy plant among the prickly pears, as to flower, was the new "semaphore" discovered on Big Pine Key in the spring of 1919. The specimens had grown vigorously during the year that they had been set out in the garden. The flowers proved to be small compared to the size of the plant.

The corolla is a crimson-like structure and the sepals and petals persist without withering and falling off promptly as they do in the case of the typical prickly-pears. However, the most instructive feature of this novelty lies in the receptacle and pistil. It furnishes a striking example of the fact that a flower is a branch. If the ovules are fertilized the receptacle with its included organs naturally develops into a baccate fruit. But, if fertilization does not take place for some reason or other, the flower receptacle reverts into an ordinary vegetative branch or "joint," and does not fall away as the unfertilized flowers do in the typical prickly-pears.

A Cruise to the Saint Lucie Rivers

The last week in the field was devoted to an inland cruise. It was not a fresh-water cruise, however, but a salt-water one. Our course lay through the lower part of the Coastwise Canal or inland waterway that connects New York with Key West.

The "Barbee" was put into commission again and we sailed one morning up through Bay Biscayne into the mouth of the canal which begins, or ends, at the head of the bay. Its course runs parallel or nearly so to the nearby ocean, through various shaped lagoons or channels dredged through the shallow intervening mangrove swamps, or occasionally by a short-cut directly through pinelands and prairies. The course is not monotonous as might be imagined. It is a panorama of everchanging contour, vegetation, and colors.

In some places the red-mangrove (*Rhizophora*) alone was in view. In other places, associated with the red-mangrove, was the white-mangrove (*Laguncularia*), the black-mangrove (*Avicennia*), and the buttonwood (*Conocarpus*), all with different shades of green. To the association of trees was afterwards added an entanglement of the stout woody coin-vine (*Dalbergia*), which climbed to the tops of the tallest trees and which contributed still another shade of green—a very light green. Islands were sometimes completely covered with an entanglement of the coin-vine to the exclusion of other vegetation. On other islands the leather-fern (*Acrostichum*) or the hammock-mallow (*Malache*) vied with the coin-vine in rankness of growth, the result being an impenetrable barrier that could be passed only by actually cutting a way through the vegetation.

Associated with the vegetation nearly everywhere was the wild-rubbervine (*Rhabdadenia biflora*), which lent variety to the landscape in the morning by its numerous immaculate flowers, just as the moonvine does in its natural range, only on a smaller scale.

As we proceeded northward, when the vegetation bordering the canal was low, sometimes the barrier-beach could be seen towards the east, and sometimes the distant pineland came into view toward the west. There, too, the several mangroves were segregated. The red-mangroves, the white-mangrove, and the black-mangrove, often formed almost pure colonies. Where the canal had been dredged through prairie-like areas with streams draining the Everglades, the red-mangrove had floated in and taken possession of the banks. Like the usually accompanying oyster, this tree thrives in water that is partly fresh.

Below New River Sound we found the date-palm (*Phoenix dactylifera*) growing near the canal, thus indicating a former settlement or camp where trees were planted or seeds thrown in the sand. This tree has sprung up from seeds in various parts of the state.

The Australian pine (*Casuarina*) was noticed at various points along or near the canal, where the seeds had been carried by winds or tides, just as it was self-sown along the wild southern coast of the penuinsula.

New River Sound still exhibited a wealth of shades of green, not equaled elsewhere, and, in addition the young foliage of the poisonwood (*Metopium*) and of the seaside-grape (*Coccolobis*) showed bright red on the western shore. On the barrier-dunes the native century-plants (*Agave*) and the Spanish-bayonets (*Yucca*) raised their inflorescences high above the dense growth of the hard-wood trees and shrubs.

Northward the swamps and marshes often supported plants of a different character from those southward. Alternating there would be areas of poisonwood, cabbage-tree, cocoa-plum, seaside-mahoe, pond-apple (*Annona*) or Florida-privet. Ferns, too, were represented, and vast areas given over to the leather-fern (*Acrostichum*), brake (*Pteris*), or swamp-bracken (*Blechnum*) were seen on either side of the canal. The immediate canal banks or shores were decorated with yellow flowers—prickly-pears (*Opuntia*), wild-sage (*Lantana*), sea-oxeye (*Borrichia*), sunflower (*Helianthus*), and flaveria (*Flaveria*).

In some of the palm groves the cabbage-trees served as great arbors for vines of grape (*Vitis*), Virginia-creeper (*Parthenocissus*), scuppernong (*Muscadenia*), and a couple of kinds of cat-brier (*Smilax*). The "boots," i. e., the persistent imbricate leaf-bases on the trunk, having caught and held the seeds sown by birds often supported plants of the strangling-fig (*Ficus*), the cocoa-plum (*Chrysobalanus*), and the prickly-pear (*Opuntia*).

The embankments of sand, piled up in dredging the canal through shallow creeks between the natural lagoons to make short-cuts, furnished the most fertile field for observation and speculation. These banks of sand exhibited methods of seed dispersal by animals, both birds and mammals, and also by air currents, in a most interesting and forcible manner. For example, we found the silver-palm (*Coccothrinax argentea*) planted by migratory birds on the canal embankments over a hundred miles north of its natural center of distribution in Florida, and nearly seventy miles north of the former known northern limit of distribution. This palm stopped naturally at the Miami River. Now, the vegetation of the canal embankments has come there since the banks were thrown up about 1908. Of course, to begin with they were barren piles of sand. Within a comparatively few years they have become clothed with herbs, shrubs, and trees.

The silver-palm is on the embankments and apparently nowhere else in the region. The migratory birds brought the seeds either from further south in Florida or from the West Indies where that palm is plentiful. The birds either follow the course of this inland waterway closely in their flight, or seeds dropped in neighboring parts did not germinate or at least did not survive after germination. Of course, the latitude is against the natural development of this tender palm, but the tempering effect of the canal, lagoons, and marshes, although slight, may be sufficient to enable the palm growing directly on the banks to survive the cold spells in winter.

Of course, the cabbage-tree (*Sabal*) is now plentiful on the banks, but it has been derived from the immediate region. However, a single plant of one of the thatch-palms (*Thrinax*) was noticed in passing. The seed from which it was derived was probably brought all the way from the Florida Keys. This invasion of southern palms extends almost up to Lake Worth.

On Indian Prairie west of Lake Okeechobee.—Seminoles—the Stuart family—on a blueberry-picking expedition. The fruit of *Vaccinium Myrsinites* is eagerly sought by both the red-man and the white. The Indian calls the blueberry Tol-o-lock-o. Unlike our northern blueberry bushes, the vaccinium in question is a low-growing evergreen shrub with numerous small leathery leaves. It grows in pinelands and "scrub, ' and on prairies about the edges of hammocks.

Passing from birds to mammals, we found that where hammocks were within a mile, more or less, on either side of the canal, the kinds of trees bearing edible fruits had evidently been planted on the banks by animals coming from the hammocks to the canal for water after having eaten the fruits in the hammock. The mastic (*Sideroxylon*) was one of the more common trees of this category. When the neighboring hammocks were only on one side of the canal these trees were only on the corresponding bank; where there were no hammocks nearby the trees were wanting on the banks.

The wind-distributed plants growing on these sand-banks were most prominently represented by the groundsel-bushes (*Baccharis*) and the marsh flea-banes (*Pluchea*). Then, too, there were plants introduced along the banks through the agency of water. We sailed through floating islands of water-hyacinth (*Piaropus*), water-lettuce (*Pistia*), and pennywort (*Hydrocotyle*).

A curious phenomenon was noticed where the water had exposed the junction between the former natural surface of the ground and the bottom of the sand-banks. There the roots sent down by the various introduced shrubs and trees seemed to refuse, for some unexplained reason, to penetrate further. A horizontal tangled mass of roots therefore marked the junction of the former natural surface of the land and the base of the artificial bank.

The first night out we anchored in the southern end of Lake Worth. The mosquito band from the nearby Hypoluxo—not long in discovering our presence—promptly came abroad and serenaded us with their delicate music and tantalized us with their poisoned beaks all night long.

The following forenoon we pressed on towards our destination. Along the way, south of Jupiter lighthouse, we found colonies of the seaside mahoe (*Paretium*). North of Jupiter Light a part of the "scrub" dunes were destitute of spruce-pine, a condition brought about by repeated fires from the period of the Seminole Wars when Fort Jupiter itself was burned. Beyond this now pineless area, both to the west and to the north, was a copious growth of pine trees. The continuous easterly winds sweeping unobstructedly over the gradually sloping dunes, have brought about an abnormal development of the pine trees, spreading

them out, as previously noted in connection with other growths. From the lagoon through which we passed, this forest, with its new foliage, resembled a vast closely cropped lawn of a vivid green.

Northward of Jupiter, Hobe Sound was the next region of interest. This represents a case where "history repeats itself." Just as the moderns have selected the eastern shore of the sound for residental purposes, the aborigines long ago selected the same shore, as is evidenced by the large kitchen middens which they left piled up on the sand and coquina rock that crops out there. As a consequence of this natural geologic formation on the western side and the artificial one on the east, we find "scrub" with its pine and scrub-oaks on the west and hammock with its various broad-leaved trees on the east.

Our ultimate objective was the Saint Lucie River region. We stopped at Rio and picked up Mr. L. H. Toussaint at Mt. Pisgah. This high sand dune was at one time the lookout of the pirate Gilbert; at other times, perhaps for ages, it was the center of a region where the Indians, Seminoles or aborigines, burned off the vegetation, let the open area grow up in grass and small shrubs, and there secured the game that would come in to graze and browse.

We spent part of a day exploring the Halpatyoke River, on some modern maps called the South Fork of the Saint Lucie River, as far as it was navigable, to the point where the Saint Lucie canal from Okeechobee will meet it, and find an outlet to the eastern coast. There, one of our woody plants (*Randia aculeata*), heretofore known only as a shrub, grew as a small tree.

The second night out we anchored in the Saint Lucie Estuary off Mt. Pisgah. The shades of the pirate Gilbert did not disturb us; in fact they did not have a chance; for the mosquito band came aboard early and stayed with us for the night. Their fiery bills permitted of scarcely any rest. We first tried sleeping in the cabin, then we repaired to the upper deck; after that the forward deck and the rear deck in turn were tried. Finally each member of the party sought a corner for himself. The writer sank down exhausted on the large anchor directly on the bow and there in the strong breeze managed to get a restless hour's sleep just before dawn. He was discovered there by his

companions, who believe to this day that he actually selected the anchor to sleep on for fear the mosquitoes would carry him away.

Part of a day was devoted to the North Fork of the Saint Lucie. This and the Halpatyoke River meet at Stuart, but the vegetation along each of them is quite different. A "wild pecan" had been reported as growing along the North Fork; it proved to be the water-hickory (*Hicoria aquatica*), and this is perhaps the southern limit of its distribution along the eastern coast of Florida.

On the return trip we gathered living specimens of silver-palms, cacti, and other plants for growing at Buena Vista and in our conservatories. We brought two silver-palms to the Garden and one still survives. If it thrives, it will represent the first specimen, from Florida so far as we know, that has been grown under glass, at least from transplanted specimens, as the plants are very hard to transplant successfully.

JOHN K. SMALL

PRELIMINARY REPORT OF INVESTIGATIONS WITH SPECIES OF LILIUM.

Dr. N. L. BRITTON, *Director-in-Chief.*

Dear Sir:

For several years I have made observations on the propagation by seed of the various species of *Lilium* that have been growing in our Garden, and three species, *L. tigrinum*, *L. candidum* and *L. longiflorum*, have been subjects of special experimental studies. The opportunity to greatly extend the studies of this genus has recently come through the personal interest of Mrs. Mortimer J. Fox whose liberal financial support has made possible during the past two years the purchase of bulbs of over 30 species. In cooperation with Mrs. Fox, Miss Hester M. Rusk and I have vigorously prosecuted studies with these plants obtaining some definite results of which a preliminary report may now be made with regard to the main objects in view.

I. *Cultural requirements.* One object of the studies is to determine the cultural needs of the different species and parti-

cularly of those otherwise desirable species which do not seem to thrive under average garden conditions. Mrs. Fox is giving special attention to this matter in tests at her country place. She is also making a study of the most satisfactory effects to be achieved in grouping lilies with other perennials. A group of species suited to gardens is being grown in a display bed for testing and for exhibition to the public. It is very apparent that the condition of bulbs at the time they are planted is an important factor in the establishment and subsequent growth of any planting of lilies. Bulbs have been received in such poor condition that they fail to bloom or even to grow despite the best cultural conditions. It is hoped that the growing of progenies from seed and by vegetative propagation will furnish a supply of fresh sound bulbs which will facilitate these tests.

II. *Studies of seed sterilities.* Various species of *Lilium* have long been known to produce seed very irregularly and often not at all. The investigations have clearly shown that the condition involved in this seed sterility is chiefly that of incompatibility in fertilization. This is a well defined type of sterility frequently seen in hermaphrodite plants giving both self- and cross- incompatibility for plants grown from seed. Incompatibilities have been found in all the species of *Lilium* that we have investigated. They are strongly present in such newly introduced species as *L. regale* and *L. warleyense.* In the old and well-known species *L. tigrinum* there appears to be only a few records of seed production. Special attention is being directed to this species and wild bulbs have been obtained from China through the kindness of Professor J. L. Buck, Dean of the College of Agriculture and Forestry, University of Nanking, and it is hoped that these will prove compatible with the cultivated strains and that seeds for propagation will result from such intervarietal crossing. In order to secure seed of any species of *Lilium* it is necessary to have plants that are either self-compatible or cross-compatible.

Other types of sterility have been observed such as intersexes in *L. croceum* and impotence evidently from hybridity in *L. Batemanniae.* A rather complete study is being made of the types and the extent of sterilities in all the species.

III. *Hybridization.* Many crosses between varieties and between recognized species have been made with the hope of

securing new varieties of merit. Thus far the successful species crosses that have given seedlings have been between species obviously closely related such as *L. elegans* with *L. croceum*. It appears also that several species native to the United States and related to *L. canadense* will hybridize and the growing of plants from seed thus obtained is awaited with interest. The limitations and possibilities throughout the genus of hybridization are being tested as fully as is possible.

IV. *The growth of seedlings.* Already several thousand seedlings have been obtained. Those of *L. Henryi* and *L. speciosum* are especially vigorous and easy to grow. Several types of germinations are seen. In some species the cotyledon quickly appears above ground and becomes green and leafy; in others it remains in the soil but the first leaf soon appears above ground. In other species, including at least some of our native American ones, the seedling remains in the soil during the first year and forms a small bulb before leafy green organs extend into the air. As fast as seed is secured in abundance tests are made as to the best time for germination and the most favorable conditions of soil and water supply. Seeds of several species have also been obtained from various botanical gardens and from the Office of Foreign Seed and Plant Introduction, U. S. Department of Agriculture. Already seedlings of *L. longiflorum* have bloomed. In the spring and summer of 1924 we may expect to have seedlings of several species and of species hybrids in bloom.

V. *Taxonomic relationships.* All of the material is being studied in respect to the natural grouping and relationships of the various species. The question whether such wild species as *L. canadense* and *L. superbum* can hybridize in nature and give intergrading progenies is being tested experimentally. Pedigreed cultures grown from seed and by vegetative propagation are being studied in respect to the stability of differentiating characters. For the purpose of record and for possible future illustration specimens typical of various species are being painted by Miss Eaton and numerous photographs are being made.

The plan for 1922–1923 embraces the purchase of bulbs of numerous varieties for the extension and continuation of the various studies under way. Efforts are also being made to

obtain bulbs of wild plants particularly of the European and Asiatic species.

Respectfully submitted,

A. B. STOUT,

Director of the Laboratories

NOTES, NEWS AND COMMENT

Leave of absence for nine months beginning with September 15, 1922, has been granted to Dr. A. B. Stout, of the Garden Staff who will spend the period in southern California in studies of citrus fruits. A special investigation will be made of sterility and fertility in the different varieties of oranges with reference to crop production. Dr. Stout will collaborate with the Bureau of Plant Industry. The special arrangements for this investigation have been made by the authorities of Ponona College at Claremont which is in the heart of the orange growing section. Dr. Stout will make his headquarters at the college and during a part of the school year will give lectures and offer research and seminar work on problems of plant breeding and crop production.

The following visiting botanists have enrolled in the library during the summer: Professor H. M. Kirkpatrick and H. H Whetzel, Ithaca, N. Y., Professor J. R. Schram, Dr. Jas. R. Weir and Dr. Tyozaburo Tanaka, Washington, D. C., Prof. John W. Harshberger and class, Cold Spring Harbor, L. I., Mr. Herbert W. Faulkner, Washington, Conn., Mr. Leland S. Slater, Albany, N. Y., Professors John T. Buchholz, Fayetteville, Ark., H. H. York, Morgantown, W. Va., Donald W. Davis, Williamsburg, Va., L. J. Pessin, Agricultural College, Miss., James P. Kelly, State College, Pa., Mr. G. O. Ocfemia, Los Banos, P. I., Prof. A. L. Herrera, Mexico, Mex., and Prof. I. B. Pole Evans, Pretoria, S. Africa.

Meteorology for August. The total precipitation for the month was 2.20 inches. The maximum temperatures recorded for each week were: 88° on the 5th, 90° on the 8th, *97° on the 16th* and 85° on the 22nd and 23rd. The minimum temperatures were: 60° on the 5th, 56° on the 11th, 61° on the 20th and *51° on the 21st.*

ACCESSIONS

MUSEUM AND HERBARIUM

24 specimens of flowering plants from the Gila National Forest. (By exchange with the Forest Service.)

1 specimen of *Cyperus brunneus* from Barbados. (By exchange with Prof. L. H. Bailey.)

1 specimen of *Pogonia ophioglossoides brachypoda.* (By exchange with Harvard University.)

121 specimens of marine algae from Mauritius. (By exchange with Mr. J. Cosmo Melvill.)

4 specimens of Hepaticae from New England. (By exchange with Miss Annie Lorenz.)

53 specimens of cactuses. (By exchange with the U. S. National Museum.)

4000 specimens from Porto Rico. (Collected by Dr. and Mrs. N. L. Britton.)

1 specimen of *Riccardia multifida* from Vermont. (Given by Miss Elsie M. Kittredge.)

4 specimens of algae from Bermuda. (Given by Dr. H. H. Whetzel.)

45 specimens of marine algae from Porto Rico. (Given by Mr. C. E. Chardon.)

25 photographs of cactuses. (By exchange with the U. S. National Museum.)

3 specimens of *Radicula palustris* from Connecticut. (By exchange with the Rural New Yorker.)

1 specimen of *Tetraclea Coulteri* from Texas. (By exchange with Miss Ellen D. Schulz.)

483 specimens of flowering plants from Massachusetts. (By exchange with Harvard University.)

5 specimens of *Riccia* from Texas. (Given by Prof. F. McAllister.)

10 specimens of fungi from Oregon. (By exchange with Prof. S. M. Zeller.)

27 specimens of fungi from French Guiana. (By exchange with Mr. W. E. Broadway.)

20 specimens "Fungi Wisconsinensis Exsiccati." (Distributed by Dr. J. J. Davis.)

1 specimen of *Mycena varicolor* from Pennsylvania. (By exchange with Dr. L. O. Overholts.)

600 specimens "Reliquiae Farlowianae." (By exchange with Harvard University.)

200 specimens "North American Uredinales," centuries 26 & 27. (Distributed by Mr. Elam Bartholomew.)

1 specimen of fungus from Venezuela. (By exchange with the Smithsonian Institution.)

15 specimens of *Pezizella Lythri* from North America. (By exchange with Drs. C. L. Shear & B. O. Dodge.)

1 specimen of *Nectria tucumanensis* from Costa Rica. (By exchange with Prof. W. W. Rowlee.)

1 specimen of *Ramularia fraxinea* from Wisconsin. (By exchange with Dr. J. J. Davis.)

1 specimen of *Coprinus sterquilinus* from Pennsylvania. (By exchange with Dr. L. O. Overholts.)

1 specimen of *Sclerotinia carunculoides* from South Carolina. (By exchange with the U. S. Department of Agriculture.)

1 specimen of *Pseudoplectania nigrella* from Virginia. (By exchange with Dr. E. G. Arzberger.)

1 specimen of *Sclerotinia Geranii* from New York. (Collected by Dr. F. J. Seaver.)

3 specimens of fungi from Pennsylvania. (By exchange with Dr. L. O. Overholts.)

37 specimens of *Pezizella Lythri* from North America. (By exchange with the U. S. Department of Agriculture.)

4 specimens of fleshy fungi from Alabama. (By exchange with Dr. R. P. Burke.)

PLANTS AND SEEDS

3 plants for iris garden (given by Mr. Arthur H. Scott).

1 plant of *Persea* for conservatories (given by Mrs. D. M. Steindler).

57 plants of *Iris* from England (given by The American Iris Society).

3 plants for conservatories (given by Mrs. F. A. Constable).

2 plants of *Laelia purpurata* (given by Mr. H. W. Becker).

32 plants from Florida (collected by Dr. J. K. Small).

1 plant of *Stenochlaena* from Florida (collected by Mr. C. A. Mosier).

2 plants of *Iris prismatica* from N. J. (collected by Dr. J. K. Small).

9 plants for rock garden (collected by Dr. N. L. Britton).

2 plants of *Helonias bullata* (collected by Dr. A. T. Beals).

3 plants for conservatories (by exchange with Mr. Albertson through Dr. E. T. Wherry).

38 cactus plants for conservatories (by exchange with U. S. Nat. Museum through Dr. J. N. Rose).

7 plants for nurseries (by exchange with Mr. Chas. C. Deam).

1 plant of *Tradescantia Warscewicziana* (by exchange with U. S. Dept. Agri. through Dr. J. N. Rose).

2 plants of *Opuntia* (by exchange with Dr. E. T. Wherry).

11 orchids (by exchange with Mr. Jos. A. Manda).

2 plants for conservatories (by exchange with Mr. W. C. Ferguson).

6 plants for conservatories (by exchange with Mr. C. Le Duc).

1 plant for conservatories (by exchange with Agric. College of Kansas).

9 plants of *Hymenocallis* (by exchange with Charleston Museum).

3 plants of *Begonia* for conservatories (by exchange with F. R. Pierson Co.).

35 plants for conservatories (by exchange with Dr. Houghton).

1 plant of *Clerodendron* (by exchange with Mr. S. S. Hordes).

104 gladiolus bulbs (given by Mr. J. A. Kemp).

33 bulbs of *Nemastylis* (by exchange with Mr. Geo. L. Fisher).

3 plants from seed.

4 packets of seed from Mexico (given by Prof. Juan Balme).

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6. Privileges of the Board Room.

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Annual members may become life Members by the payment of a fee of $250.00.

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Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

Form of Bequest

I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....

Vol. XXIII November, 1922 No. 275

JOURNAL

OF

The New York Botanical Garden

EDITOR

R. S. WILLIAMS

Administrative Assistant

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN
AT 8 WEST KING STREET, LANCASTER, PA.
INTELLIGENCER PRINTING COMPANY

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In the swamp of Little River, Gadsden Co., Fla.—The blue stem (*Sabal minor*), shown above, and the needle-palm (*Rhapidophyllum Hystrix*) grow plentifully under the cow-oak trees the fallen leaves of which may be seen on the ground. The very rich soil supports a remarkably luxuriant growth of the palms The specimen here illustrated is in fruit; the slender panicles with small berries may be seen arching over and beyond the leaves.

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VOL. XXIII November, 1922 No. 275

THE BLUE-STEM — SABAL MINOR

With plate 280

It is an interesting fact that this, the most humble of our palms, albeit the most widely distributed, should have been the first one to be botanically named and described. On account of its lowly habit and its less prominent habitat, however, it did not get such extensive recognition as its showier relatives in the writings of the earlier botanists of either America or Europe.

Perhaps the earliest definite references to this dwarf-palmetto occur in a work which appeared in 1765, under the following title:

"AN ACCOUNT OF EAST FLORIDA; WITH A JOURNAL KEPT BY JOHN BARTRAM, OF PHILADELPHIA, BOTANIST TO HIS MAJESTY FOR THE FLORIDAS, UPON A JOURNEY FROM ST. AUGUSTINE UP TO THE RIVER ST. JOHNS. LONDON 1765."

"Chamaerops humilis Linn. Spec. 1657—Dwarf-palmetto. This dwarf palm grows on the sea-coast from the capes of Florida up to Charles-town in South Carolina, and bears bunches of berries something larger than black currants: These contain sound horny seeds which are of the size of small peas, and are covered with a thin pulp, which the Indians use as food. The leaves furnish them with thatch, and the soil where they grow is judged to be a middling kind between the sand and the swamp."

" . . . the small palmetto or chamaerops yields a small white bud no larger than one's finger, which is eaten by men, bears, and horses in case of great need; . . . "

" . . . ; we camped on a descending bank on the back of which was scrub-oak and dwarf-palmetto or chamaerops; here we cooked a fine mess of palm-cabbage."[1]

[1] These three quoted paragraphs are from the above cited work by William Stork, pages 7 (reprint 35), 20 (reprint 43), 23 (reprint 45), respectively. The reprint was issued from the office of The Florida Mirror, Fernandina, Florida, 1881.

Living specimens of the dwarf-palmetto, as this palm is also called, found their way to Europe about the middle of the eighteenth century. Plants or seeds may have been sent across the Atlantic from the southern states by Mark Catesby, Thomas Walter, or John Bartram. There are not many prominent collectors of that early period to choose from, as the more numerous European collectors did not enter the field until later.

At any rate, a plant found its way to Vienna where, after it had flowered and fruited, Nikolaus Joseph von Jacquin[1] figured and described it in the third volume of the Hortus Botanicus Vindobonensis, in 1776. The description appears on page eight of that work and a colored plate is numbered eight. Jacquin gave it the name *Corypha minor*. In beginning his account of the specimen Jacquin says:

"I have not been able to find mention of this elegant palm elsewhere. It flowered first in some year before 1773 in the Imperial Schöenbrunn Garden, cultivated there by the superintendent Richard van der Schot, an excellent gardener and companion at one time on my American journey for the purpose of collecting plants for me."[2]

A dozen years later the plant was named again, this time in America. Thomas Walter[3] named it *Corphya pumila* in his

[1] Nikolaus Joseph Jacquin belonged to a wealthy Dutch family of French origin, and was born at Leyden, 16 February 1727. He studied at Antwerp, Louvain, Leyden, and Paris, and in 1752 went to Vienna to complete his medical education. Here he attracted the attention of the emperor, Francis I, who commissioned him to conduct an expedition to tropical America on behalf of the royal botanical and zoological gardens at Schönbrunn and the natural history museum of Vienna. He set sail in January 1755, and did not return until July 1759, exploring meanwhile various West Indian islands and portions of the north coast of South America. After spending several years in Vienna, studying his collections, he went to Chemnitz in 1763 as professor of chemistry, but in 1768 returned to Vienna as professor of botany and chemistry in the university. He retired from his professorship in 1796, but remained in Vienna and continued active botanical work. He was ennobled ("Edler") in 1774, and created a viscount (" Freiherr") in 1806. He is best known to the botanical world because of his monumental publications, in all more than thirty folio and quarto volumes, illustrated by nearly three thousand plates, most of which were beautifully colored by hand. He died at the age of ninety, at Vienna, 26 October 1817.—John Hendley Barnhart.

[2] Hortus Botanicus Vindobonensis **3:** 8. *pl.* 8. 1776.

[3] Thomas Walter was born in England about 1740, and settled in South Carolina as a planter in early life. His "Flora caroliniana" (1788) is astonish-

Flora of Carolina in 1788.[1] Just after the beginning of the last century, John Drayton,[2] a resident of South Carolina, referred to the plant as follows: "Dwarf-palmetto (*Corypha pumila*) grows in swampy land, which is generally dry; situated at the head of fresh water rivers, in the low country. It also grows on the Sea Islands."[3]

Fifteen years passed, and our little palm received another name. André Michaux[4] in describing it in 1803[5] gave it the name of *Chamaerops acaulis*. At this point we must go back

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ing when considered as the work of a solitary student in an isolated field, and will ever maintain its position as a botanical classic. Walter died in 1788, the year in which his Flora was published; his grave, in what was once his garden, the second botanical garden established in America, is now in a forest wilderness. The British National Museum contains a collection of plants made by Walter, presumably several years before the publication of his Flora.—J. H. B.

[1] Thomas Walter, Flora Caroliniana 119. 1788.

[2] John Drayton was born 22 June 1767 at Charleston, South Carolina. He was only twelve years old at the death of his father, then chief justice of the state. He studied law, and was admitted to the bar at twenty-one, practicing as an attorney in Charleston until 1794. He was a member of the state constitutional convention in 1790, and thereafter, for more than thirty years, he was almost continuously in public service. For some years he was a member of the lower house of the state legislature; in 1799, lieutenant-governor; from 1800 to 1802, governor; from 1803 to 1808, state senator; in 1809 and 1810, governor for a second term; and from 1812 until his death in 1822, judge of the United States court for the district of South Carolina. He died at Charleston, 27 November 1822. His book entitled "A view of South Carolina" (1802) contained a 25-page catalogue of the most remarkable plants of the state. His most important botanical work, however, was never published; it was an English translation of Walter s "Flora caroliniana," with additions from Walter's original memorandum book and other sources. Two copies of this manuscript, one dated 1798, the other 1807, are preserved in South Carolina libraries.—J. H. B.

[3] A View of South Carolina 66. 1802.

[4] André Michaux was born 7 March 1746, at Satory, near Versailles. In 1782–1785 he was engaged as a botanical explorer in Persia, and from 1786 to 1796 was occupied with a similar mission in the United States, under the auspices of the French government. He collected both living and dried plants, from Hudson Bay to Florida, and from the Atlantic to the Mississippi, these serving as the basis for his flora of North America, published under the anonymous editorship of Louis Claude Marie Richard (1754–1821) in 1803. Meanwhile Michaux, who had accompanied the French exploring expedition of 1800-05, had died in Madagascar, 13 November 1802.—J. H. B.

[5] Flora Boreali-Americana 1: 206. 1803.

prior to the earliest date already mentioned. In 1763, Michel Adanson[1] published the name *Sabal* for a palm he also designated as "Palma Caroliniana—swamp palmetto,"[2] but failed to give the origin of the name or the nativity of the plant, except indirectly by the word "caroliniana."

Over forty years later, in 1804, one of the major events in the history of the dwarf-palmetto occurred: L. B. Guernsent[3] published a paper entitled "Observations sur le Sabal d'Adanson."[4] He found a palm in the Botanical Garden of Rouen, which, in some way, neither stated nor directly implied, he connected with the name *Sabal* of Adanson.[5] He seems to have used the name in order to preserve and establish Adanson's proposed genus. In a preliminary discussion, Guersent mentions the genera *Corypha* and *Chamaerops* with the specific names already proposed by Jacquin, Walter, and Michaux, and discusses the general characters of *Sabal* as compared with those of *Corypha* and *Chamaerops*. He then describes *Sabal Adansonii*, giving synonyms, and adds a discussion of the specimen.

The particular specimen of Guersent may have been derived from the plant grown in the Vienna Garden. Jacquin said that the plant flowered and fruited each year, and that each and every seed germinated when planted. The plate of Guer-

[1] Michel Adanson, scion of a French family of Scottish origin, was born at Aix, in southeastern France, 7 April 1727. He was a precocious child, and became interested in the study of plants, and in speculations concerning their relationships, at an early age. When only twenty-two he set out for Africa, and spent five years (1749–1753) in the exploration of Senegal. Upon his return he worked upon the history of his voyage, but only one volume (1757) was published. In 1763, in two volumes, appeared his "Familles des plantes," the work by which he is best known to botanists. In later years he did a prodigious amount of writing and drawing, being engaged upon several natural history works planned on a grand scale, but most of his manuscripts were never published. He was a member of the Paris academy of sciences and of the Royal society of London. He died at Paris, 3 August 1806.—J. H. B.

[2] Familles des Plantes 2: 495. 1763.

[3] L. B. Guersent, born in 1776, was a famous Paris physician, specializing in the diseases of children. He was a member of the Paris academy of medicine and most of his published papers are on medical topics, but several are botanical. He died at Paris, 22 May 1848.—J. H. B.

[4] Bulletin Société Philomatique de Paris 2: 206. 1804.

[5] Familles des Plantes 2: 495. 1763.

sent is much more diagramatic and crude than that of Jacquin, but it is plainly meant to represent the same species.

During the next year (1805), C. H. Persoon[1] also described the genus *Sabal*, but in referring to the species he used the first published name, that of Jacquin, making the binomial *Sabal minor*.[2] This palm's nomenclatorial troubles subsided for about four decades, when they broke out again. William Baldwin,[3] writing from Fernandina, Florida, to a friend in Pennsylvania in 1916, said of the palm: "The *Chamaerops acaulis* of Michaux, —which I would call *C. sabaloides*, as it is not the only acaulescent species,—is found in low swampy land, suitable for the cultivation of rice. Mr. Pursh speaks of it as a palm of 'little beauty or use:' but why such an exception should be taken to a species of this beautiful genus, I cannot conceive."[4]

Nor is this the end of the story, so far as names for this palm are concerned. The name *Sabal Adansonii* stuck to it pretty well for nearly a century. Then the name of some Jamaican

[1] Christiaan Hendrik Persoon was born in 1755 at the Cape of Good Hope, son of a Dutch father and a Hottentot mother. He went to Holland in 1767, and studied medicine at Leiden. He inherited an income sufficient to provide for his simple needs, and devoted himself for many years to the study of plants and especially of fungi, for pure love of scientific work. He lived in several German university towns, but had no official connection with any of the institutions. When he first began his long series of published works his home was at Göttingen. About 1800 he went to Paris, hoping to benefit by the appreciation he might command from French scientists, in view of the reputation he had already established in Germany. But his ugly features and repulsive habits prevented the recognition for which he had hoped; his fortunes suffered until his income nearly vanished; and for some years he lived in a single room in a poor quarter of Paris. About 1825 he presented his herbarium to the university at Leiden, where it is still preserved, and was in consequence pensioned by the Dutch government. This pension, however, ceased with the separation of Holland and Belgium in 1830, and Persoon was reduced to extreme poverty before his death, which occurred at Paris, 17 February 1837.—J. H. B.

[2] Synopsis Plantarum **1**: 399. 1805.

[3] William Baldwin, was born in Newlin township, Chester County, Pennsylvania, 29 March 1779. He visited China as surgeon on a merchant vessel in 1805, and received his medical degree from University of Pennsylvania in 1807. From 1812 to 1818, he was a surgeon in the United States navy, most of the time stationed in Georgia or Florida. Appointed surgeon and botanist to Long's expedition up the Missouri, he died at Franklin, Missouri, 1 September 1819.—J. H. B.

[4] Reliquiae Baldwinianae 334, 1843.

palm, described and discussed by Phillip Miller,[1] was associated with it as *Sabal glabra* (Mill.) Sargent.[2]

Under the heading of *Chamaerops*, Miller said: "The second sort grows naturally in the West Indies, where it never rises with a stem; the foot-stalks of the leaves are rounder than those of the former *Chamaerops humilis* and have no spines on their sides. When the plants are old their leaves are three or four feet long, . . . ; some of these plants have put out slender bunches of male flowers in England, which were too imperfect to form a description.

"This sort rises freely from seeds which may easily be procured from the islands in America; . . . .

"I have received seeds from Carolina of a Dwarf Palm, which is very like this, if not the same; but the plants do not make so good progress here, as those which came from Jamaica; the berries were so like, that I could not distinguish them, but as the plants advance, if they are different, it will appear."[3]

There seems to be no good reason for referring the name of a Jamaican palm, which may belong to this group, to a species of the southeastern United States. Miller does not claim that the Jamaican and the mainland plants were the same. He did say that the fruits were alike, but the berries of many palms look similar.

It appears that nearly a century passed after Persoon published the binomial *Sabal minor* before that name was taken up by Charles Mohr[4] in American botanical literature.[5]

[1] Philip Miller was born in 1691, probably at Chelsea, London, where his father was the gardener in charge of the famous botanic garden of the Company of Apothecaries. He succeeded his father in this office in 1722, and held it for nearly fifty years. He was a keen botanist as well as horticulturist, and was the most famous gardener of his day. He was the author of numerous important books, of which the best known are the various editions of his "Gardener's dictionary" (1731–1768), and his "Figures of plants" (1755–1760). He was retired, with pay, in 1770, and died at Chelsea the following year, 18 December 1771.—J. H. B.

[2] Silva of North America **10:** 38. 1896.

[3] The Gardener's Dictionary, Ed. **8:** No. 2. 1768.

[4] Charles Theodore Mohr was born 28 December 1824, at Esslingen, Württemberg, where his father was a manufacturer of chemicals. His interest in botany began early; in 1846 he spent seven months with Kappler in South America, collecting plants in Surinam. In 1848 he left Germany for the United States, and in the summer of 1849 crossed the plains to California,

Dr. Baldwin was right. The dwarf-palmetto is a beautiful palm in its native haunts. It is true the leaves are commonly disfigured by being partly eaten by cattle, and in the old days they may have been similarly disfigured by browsing wild animals.

Unlike some of our widely distributed palms, the blue-stem is very particular as to its habitat, being mainly confined to swamps. It is in the alluvium of river swamps that it is found at its best. The large, clean, bright-green leaves are evergreen and form the most conspicuous element of the vegetation throughout the year. From spring to fall its vegetative beauty is enhanced by the slender flowering or fruiting panicle which much exceeds the leaves in length. As has been mentioned by the early writers, this palm often grows in company with the needle-palm (*Rhapidophyllum Hystrix*). The contrasts between the two species are then prominent; the needle-palm having numerous dark-green leaves and short panicles.

The dwarf-palmetto grows naturally in the Coastal Plain of the southern Atlantic and Gulf States, with an extension of its range into Arkansas. It occurs on the sea islands of the Atlantic Coast, but is absent from the Florida Keys, and is not found outside the limits of the continental United States.

The origin of the dwarf-palmetto is obscure. It forms a group by itself in the genus *Sabal* as well as being the type species. Its leaves have a very short midrib or rachis, compared with

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engaging in placer gold mining for about a year. Returning east by way of Panama and New Orleans, he lived successively in Ohio and Indiana, and in Kentucky, where he entered the drug business and began the study of mosses. In 1857 he spent several months in Mexico, in the vicinity of Veracruz and of Orizaba, and before the end of that year established himself as a pharmacist at Mobile, Alabama, which was his home for more than forty years. He devoted much time throughout this period to the collection and study of plants, especially trees and grasses, giving his entire time to this work after his retirement from active management of his business in 1892. In 1890, the University of Alabama conferred upon him the degree of doctor of laws. He was the author of numerous published books and papers; his greatest work, the "Plant life of Alabama," appeared shortly after his death, which occurred at Asheville, North Carolina, 17 July 1901. His private herbarium became the property of the United States National Museum; but the herbarium of the Alabama Geological Survey, built up under his guidance, is known officially as the Charles Mohr Herbarium.—J. H. B.

[5] Contributions from the U. S. National Herbarium 6: 423. 1901.

those of our other species of *Sabal* which by some authors are included in another genus *Inodes*. This genus is characterized by the prolongation of the petiole far into the leaf-blade as a rachis which allows the blade to assume a peculiar curve and along which the sides are more or less folded and thus facing each other. Far back it was perhaps derived from the West Indies, either directly or through ancestors which have long since become extinct. There may have been additional species of *Sabal* in preglacial times. Several fossil plants have been discovered in the rocks of the later geologic periods which paleobotanists have referred to the genus *Sabal*. There may have been some species in existence right down to the beginning of the ice age during which they succumbed and the subject of this article alone survived the rigors of the climate mainly on account of its more southern geographic distribution.

JOHN K. SMALL

BOTANICAL EXPLORATION IN CENTRAL AMERICA.

The botanical exploration in Central America in 1921 and 1922 of which an account is given here was made possible by the cooperation of the Gray Herbarium of Harvard University, the New York Botanical Garden, Mr. Oakes Ames, the U. S. Department of Agriculture, and the U. S. National Museum. It was undertaken primarily for the purpose of obtaining collections in Salvador, to be used in the preparation of a descriptive flora of Central America and Panama, upon which the writer is now engaged.

I left Washington December 6, 1921, and proceeding to New Orleans, sailed from there December 10. On the thirteenth I landed at Puerto Barrios, Guatemala, and the next day went by rail to Guatemala City. The ride from the coast to the Capital is an extremely interesting one to any traveler, but more especially to a botanist. Not only is the scenery remarkably varied and striking, but the plant life also exhibits a like diversity. From Puerto Barrios to Gualán there are dense tropical jungles and thickets, abounding in ivory and corozo or cohune palms and tree ferns, much interrupted, however, by vast plantations of bananas. At Gualán begins the Zacapa

Desert, a region strongly suggestive of Sonora, Mexico, with an almost equal abundance of treelike cacti; and beyond the desert are hills, arid at first, but becoming higher and more moist, until in the vicinity of Guatemala City, where the climate is always cool or even chilly, the hills and mountain-sides are covered with a temperate vegetation, which in general appearance is not unlike that of our own Rocky Mountains.

Only a few days were spent in Guatemala City; then the train was taken to San José, Guatemala, and from there a steamer to the port of La Libertad in Salvador. I arrived in San Salvador December 19, and began collecting the next day. Unsurpassed facilities for handling the specimens were given me in the building of the Dirección General de Agricultura, and all the time that I spent in the country my work was facilitated in every way by the thoughtful kindness of Don Benjamín Arrieta Rossi, the Director, and by Dr. Salvador Calderón and Dr. Carlos Renson, who not only made arrangements for work in various parts of the Republic but anticipated all my special needs and wishes. I have never had the opportunity of collecting plants under such favorable conditions.

At first, collections were made about San Salvador, an interesting region although largely under cultivation. The greatest fault of Salvador in the eyes of the botanist lies in the fact that it is so densely populated and that little natural vegetation is left in the parts which would be otherwise the most interesting. Although much sugar cane, corn, rice, and other crops are cultivated, the most important agricultural product is coffee, and coffee fincas extend sometimes to the summits of the highest volcanoes, involving an almost complete destruction of the natural vegetation. Salvador is the most densely populated country of the western hemisphere, excepting perhaps Haiti, and there is little unimproved land in the central and western portions.

Near the Capital stands the great Volcano of San Salvador, whose eruption and the accompanying earthquake destroyed the city in 1917 (a second earthquake again ruined it in 1919), and on the slopes are to be found many interesting plants. High up, about the enormous crater, grow numerous mountain species which have been described from the similar mountains of Guatemala.

The first locality remote from San Salvador visited was Tonacatepeque, where I went in company with Dr. Calderón. Soon afterward I spent parts of two days at Finca Chilata, the beautiful estate of Don Salvador Sol, Minister of Salvador to the United States. Here it was possible to see the process of the collection of the Salvadorean balsam (often known as balsam of Peru, because of the early belief that it came from that country), almost all of the commercial supply of which is obtained here, in a limited area of Salvador, although the tree which produces it (*Toluifera Pereirae*) has a much wider range.

Early in January, in company with Oscar Núñez Calderón, and with a boy who accompanied me during all the time I was in the country, I made a trip of several weeks to western Salvador. A collection was made about Santa Ana, near which town there are small pine forests. Pine trees are rare elsewhere in the country, although I saw them also on the summits of the volcanoes of San Salvador and Conchagua, and they are said to be abundant along the Honduran frontier. Three weeks were spent in the vicinity of Ahuachapán, near the Guatemalan border, and here, in the higher mountains which lie just back of the town, many new plants were found. A few tree ferns grow here, but these are rare in Salvador, and apparently approaching extinction. Araceae are particularly plentiful in the wet ravines, but at this season of the year scarcely any bore flowers. Especially remarkable in this group is the variation in foliage exhibited by the juvenile and adult plants, which are often totally unlike. The young plants are strikingly handsome, and for this reason are desirable greenhouse specimens. A day's trip was made to the Río Paz, the boundary between Salvador and Guatemala, and in the arid valley there were seen many curious trees and other plants, some of which were not found elsewhere. A visit to Finca Colima, the property of Don Antonio Alfaro, near the south end of the Sierra de Apaneca, the only mountain chain in Salvador, gave an excellent opportunity for study of some of the timber trees, of which Salvador possesses a wonderful variety. Along the road near Ataco, one of the highest towns in the country, were many Dahlia plants, mostly out of flower, a genus not seen elsewhere in the region.

In February I went to eastern Salvador—the Oriente, as it is called—which is very different from the western and central

parts, being lower, drier, and much hotter. About La Unión, on the Gulf of Fonseca, and up on the slopes of the Volcano of Conchagua, there is little cultivated land, and consequently an interesting flora. From La Unión I visited the lakes of Olomega and Maquigüe, where there occur a large number of aquatic plants, which are rare elsewhere in Salvador.

In some places about the lake of Olomega are great thickets of a bushy morning-glory, *Ipomoea fistulosa*, with handsome pink flowers, and in others impenetrable masses of a low bushy palm, known as *huiscoyol*, covered with long needle-like spines, which is abundant in many parts of the coast, its hard and almost flavorless seeds being considered a delicacy by the natives. A shrubby *Mimosa* seems to thrive best in water several feet deep. About the margin of Lake Maquigüe there is a broad border of floating plants, principally *Salvinia*, *Pistia*, and an aquatic fern of the genus *Ceratopteris*. Far out in the lake are many plants of a showy white waterlily (*Castalia*). During the visit to La Unión, I spent a couple of days at Amapala, Honduras, on Tigre Island in the Gulf near by, a locality where were collected the types of several Central American species by one of the early English expeditions.

After leaving La Unión, a week was spent at San Miguel, an uninteresting region botanically, and a couple of weeks at San Vicente. The latter was the most remunerative locality visited in Salvador, for there is much uncultivated land in the vicinity and an exceptionally interesting flora. Through the kindness of Dr. Carlos Gavio, I visited his finca high up on the slopes of the Volcano of San Vicente, the second highest peak in Salvador, where there is still left a large area of primeval forest, with many unusual tree species. The tree trunks here are covered with mosses, as well as an abundance of bromeliads, ferns. and orchids, although there do not seem to be many species represented. Neither ferns nor orchids are particularly plentiful in Salvador, as regards species, neither the altitude nor the rainfall being sufficient for their best development.

Later on, I spent some time at Sonsonate, near the south coast, visiting also Izalco, the port of Acajutla, and other near-by localities. A trip was made to Armenia to collect some of the plants of the great swamp which lies between that place and Ateos, a region unique in Salvador, although bearing some

resemblance to the swampy north coast of Guatemala. The principal tree in this swamp is an orange-flowered *Erythrina* (*E. glauca*). The species common elsewhere in Salvador (*E. rubrinervia*) grows in dry ground, and has bright red flowers, which, when in bud, are cooked and eaten, like the flowers of the *izote* (*Yucca elephantipes*), the only yucca found in the country. In the same swamp a common plant is a species of *Equisetum*, a genus not noted elsewhere.

Collections were made later on at La Libertad, and between San Martín and beautiful Lake Ilopango. Of the 14 departments of Salvador, I visited all except three—those of Cabañas, Morazán, and Chalatenango, which lie along the Honduran frontier. These are not easily accessible, and in the limited time at my disposal it was not possible to explore them, although there is reason to believe that they have interesting floras. In most parts of the country travel is easy, for there is a railroad its whole length, besides numerous roads suitable for carts and automobiles.

The collections obtained in Salvador consist of 4,600 numbers represented by about 15,000 specimens, practically all being ferns and phanerogams. To these must be added a collection already including 1,200 numbers, and still being continued, prepared by Dr. Calderón as a basis for a herbarium of the Dirección de Agricultura. I was also presented with a considerable collection, with the promise of more, by Dr. Sisto A. Padilla. Previously almost nothing was known of the flora of Salvador, but when the present collections have been studied, we shall have probably quite as comprehensive a knowledge of the flora of that country as we already have of those of Costa Rica and Guatemala. Those are the Central American countries in which most collecting has been done, but it must be admitted that our knowledge of their floras is still sadly imperfect. Dr. Calderón and myself have planned to publish in Salvador a list of the species so far collected, with their vernacular names and other notes. A long list of vernacular names was obtained. This is an important phase of botanical work too often neglected, although in Central America it requires little effort except patience and some knowledge of Spanish.

Extensive data were obtained also regarding economic plants, of which there is a great variety in Salvador. Among them

are all the common tropical fruits, such as oranges of the finest quality, pineapples, mangos, avocados, numerous kinds of bananas and anonas, and a host of others, some of which are little known. Such, for instance, is the *pepino* (*Solanum muricatum*), a low herbaceous plant closely related to the eggplant, with purple flowers similar to those of the potato. The hand-some egg-shaped fruit, which is pale green, striped with purple, is eaten as a dessert fruit. High up on the volcanoes are grown some of the common fruits of temperate regions—apples (usually very small), peaches, quinces, strawberries, and blackberries. There is also an abundance of vegetables, nearly all those common in this country being grown. Potatoes are cultivated on the high mountains, but few of them exceed walnuts in size.

May 7, I sailed from La Libertad, reaching San José the next day. After a few days in Guatemala City, I went to Quiriguá, where three weeks were spent under the most perfect conditions imaginable for collecting. At Quiriguá is located the hospital of the United Fruit Company, which is directed by Dr. N. C. Macphail, whose work and personality are widely known in Central America, and are always the subject of the most enthusiastic and appreciative comment from all who have experienced either. I was most fortunate in having such favorable conditions there under which to work, in a region of exceptional botanic interest. The north coast of Guatemala has been neglected by botanical collectors, probably because of a belief that all the plants found at such a low altitude must be common and widely distributed species. This is far from being the case, for many localized plants, some of them undescribed, grow there. One of the most interesting of the trees is *Dracaena americana*, which in general appearance is strikingly like some of the yuccas and bears the same common name (*izote*). It was described some years ago by Capt. John Donnell Smith, and is the only American representative of a well-known Old World genus.

Although I never collected at a greater distance than two miles from the hospital in Quiriguá, over one thousand numbers were obtained there, nearly all representing distinct species, and it is likely that almost as many more occur in the area, for the last day that I went out collecting I found nearly as many new plants as on the first day. I have never seen a region equally

varied in its plant life, and the number of shrubby plants is especially remarkable.

The last place at which I collected before leaving Central America was Puerto Barrios, on the Guatemalan coast, where about ten days were spent. The flora there is similar to that of Quiriguá, but many additional species were obtained, some of them being of more than usual interest. Over 500 numbers were secured here.

I left Puerto Barrios June 11, and arrived in Washington June 17. The whole trip was a successful and agreeable one, unattended by a single unpleasant or remarkable incident, and resulted in the accumulation of a large quantity of herbarium specimens with data concerning them which will add materially to our knowledge of the Central American flora. The flora of Salvador is less interesting than those of Guatemala and Costa Rica, because the country is smaller and there is less variation in altitude, the highest mountains reaching an elevation of only about 8,000 feet. As I have already learned in the study of the collection obtained by Dr. Calderón, many of the plants of low and middle altitudes are noteworthy, and include various undescribed species. Certain plants which are very rare in herbaria are abundant in Salvador, and ample material of them was collected. The Salvadorean flora is like that of the Pacific slope of Guatemala (which, likewise has been little explored), and closely related to that of the western coast of Mexico. Among the plants thus far determined are several interesting ones known previously only from Costa Rica or Panama.

In both Salvador and Guatemala I found everyone with whom I came in contact interested in my work and ready to facilitate it in every possible way. It would be impossible to mention all from whom I received material assistance in the prosecution of the work, but I should like to mention (besides those already referred to above) particularly the following who were especially kind and helpful: Mr. Montgomery Schuyler, American Minister in Salvador and Mr. Lynn W. Franklin, American Vice-Consul; Don Román Mayorga Rivas, M. Maurice Dreyfus, Don Salvador Mugdan, Dr. Andrés van Severen, Don Federico Klein, and Don Eugenio Liebes of San Salvador; Dr. V. Manuel Huezo of Santa Tecla; Coronel Eduardo Casanova, Governor

of the Department of Santa Ana; Don Rafael Alfaro and Don Carlos Alfaro, of Ataco; Dr. Sisto Alberto Padilla, Don Juan Germán, and Don Alberto Bendix, of Ahuachapán; Don Héctor Herrera and Dr. Arturo Gallont, of Sonsonate; the officials of the Ferrocarril Internacional de Centro-América in both Salvador and Guatemala; and the officials of the United Fruit Company in Guatemala, particularly Mr. R. K. Thomas and Mr. J. C. Flucker.

PAUL C. STANDLEY

U. S. National Museum.

NOTES NEWS AND COMMENTS

The annual Dahlia Exhibition of the New York Horticultural Society was held at the Garden museum on September 22–24th. The display of cut flowers was the contribution of many able amature enthusiasts and professional cultivators. The dahlia garden a few steps from the museum, gave the visitors an opportunity to inspect the growing plants. About 500 varieties were displayed in the museum and 400 were to be seen in the garden in full bloom. Prizes for the various exhibits in the museum numbered in all about twenty-two. The first prize for the largest collection of dahlias was awarded to Miss Mira Valentine of New Canaan, Conn., who also won the silver medal of the Horticultural Society for the best collection. A prize for the best exhibit "arranged for display effect" was granted to Mills & Co., of Mamaroneck, N. Y. Mrs. Charles H. Stout, of Short Hills, N. J., also received a prize for the best collection of seedlings which created a great deal of interest among visitors.

Meteorology for Sepiember: The total precipitation for the month was 4.89 inches, all of which fell during the first twelve days. The maximum temperatures recorded for each week were: *94° on the 6th*, 85° on the 14th, 87° on the 24th and 87½° on the 30th. The minimum temperatures were 56° on the 8th, 52° on the 17th, 42° on the 19th and *38° on the 26th*. There was a light frost on the morning of the 26th.

PLANT AND SEED ACCESSIONS.

1 plant of amaryllis for conservatories. (Given by Mrs. Gerhard.)
10 plants for conservatories. (Given by Miss Mary Colgate.)
2 plants of *Cyperus* for conservatories. (Given by Mr. W. W. Heaton.)
1 plant of *Citrus aurantium* for conservatories. (Given by Miss Grace M Johnson.)
3 plants for conservatories. (Given by Mrs. Christer.)
62 plants for iris garden. (Given by Mr. John C. Wister.)
4 plants for conservatories. (Given by Mrs. John Sommer.)
9 orchid plants for conservatories. (Given by Mr. John Allen.)
29 plants for conservatories. (Given by Miss Emily Trevor.)
1 plant for iris garden. (Given by Mr. Charles Cowe.)
1 plant of *Penthorum sedoides* for rock garden. (Given by Miss M. E. Easton.)
1 plant of *Dracaena Massangeana* for conservatories. (Given by Mr. A. Hermann.)
2 plants for conservatories. (Given by Mr. Edward W. Poole.)
2 plants for nurseries. (Given by Bertolf Bros.)
5 plants of trillium for rock garden. (Given by Miss Kathyrn W. Small.)
3 plants for conservatories. (Given by Mrs. Clare via Dr. E. T. Wherry.)
9 plants for iris garden. (Given by Williamson & Cook.)
19 plants for conservatories. (By exchange with U. S. Nat. Mus. through Dr. J. N. Rose.)
3 plants for nurseries. (By exchange with Mr. E. T. Wherry.)
5 plants for rock garden. (By exchange with Mr. C. E. Demetrio.)
1 plant for conservatories. (By exchange with Mr. C. D. Mills through Dr. A. B. Stout.)
22 plants for conservatories. By exchange with Mr. Louis Piantin.)
14 cuttings for conservatories. (By exchange with Brother Leon.)
74 plants for conservatories from Florida. (By exchange with the Deering Properties through Dr. J. K. Small.)
2 plants of *Dracaena filiformis*. (Collected by Dr. Harper.)
13 plants of *Hymenocallis*. (Collected by Dr. Geo. L. Fisher.)
3 packets of seed. (Given by Mr. William W. Heaton.)
1 packet of seed from British Guiana. (Collected by Dr. H. A. Gleason.)
1 packet of seed of *Magnolia Campbellii*. (By exchange with Lloyd Botanical Garden, India.)
1 packet of seed of trillium. (Collected by Dr. J. K. Small.)
2 packets of seed for conservatories. (By exchange with Dr. Robert Runyon.)
1 packet of seed of *Passiflora*. (Given by Dr. H. H. Rusby.)

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Vol 9 (now complete), parts 1-7, 1907-1916. Polyporaceae—Agaricaceae (pars). (Parts 1-3 no longer sold separately.)

Vol. 10, part 1, 1914; parts 2 and 3, 1917. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916; part 2, 1917; part 3, 1918. Chenopodiaceae—Allioniaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913; part 6, 1918. Podostemonaceae—Rosaceae.

Vol. 24, part 1, 1919; part 2, 1920. Fabaceae (pars.)

Vol. 25, part 1, 1907; part 2, 1920; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 32, part 1, 1918. Rubiaceae (pars).

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

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Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. xvi + 320 pp., with 176 figures. 1903.

Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. viii + 138 pp., with 29 plates. 1909.

Vol. IV Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 pp., with 73 figures and 14 plates. 1908.

Vol. V. Flora of the Vicinity of New York: A Contribution to Plant Geography, by Norman Taylor. vi + 683 pp. with 9 plates. 1915.

Vol. VI. Papers presented at the Celebration of the Twentieth Anniversary of the New York Botanical Garden. viii + 592 pp., with 43 plates and many text figures. 1916.

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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIII December, 1922 No. 276

JOURNAL

OF

The New York Botanical Garden

EDITOR

R. S. WILLIAMS

Administrative Assistant

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN
AT 8 WEST KING STREET, LANCASTER, PA.
INTELLIGENCER PRINTING COMPANY

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American Holly (*Ilex opaca*)

Photograph taken in the Fruticetum of the New York Botanical Garden by J. A. Crawford.

JOURNAL
OF
The New York Botanical Garden
VOL. XXIII December, 1922. No. 276

HOLLY, LAUREL AND WINTERBERRY

(*With Plate 281*)

As the Christmas season draws near the sale of holly, winterberry and laurel puts a damper on the spirits of those who love our native plants and makes them wonder how much longer people will encourage the destruction. All of the supply comes from wild sources and there is a feeling among too many people that this is a "free country" and that vacant lands belong to the people; so they have no hesitation in invading any open or even unprotected property, and carry off loads of holly, laurel and evergreens! It will be many years before this vandalism can be checked. Just think of being receivers of stolen goods, at Christmas time!

It is with great pleasure that we are able to announce that the Garden Club of America, the New England Society for the Preservation of Native Plants and the Wild Flower Preservation Society, are all combining to bring about a better public sentiment with regard to the holly and laurel. The Garden Club of America is advocating the planting of holly and creating a demand among nurserymen for locally-grown plants; because it is a well-known fact that the holly, like many of the broad-leaved evergreens, has some races which are less hardy than others, it seems advisable to secure plants proved to be hardy in the region in which they are to be grown.

While English holly will stand clipping very well, and is extensively used for topiary work in England, those who collect the American holly for commercial purposes destroy and mutilate the trees so badly that it has disappeared almost entirely from the vicinity of all large cities! On Staten Island there are only

a few trees left, of the many that used to be found on the hill near Richmond and in the cedars which formerly occupied the present site of Midland Beach. It is known definitely on Long Island, according to Mr. Norman Taylor, from Rockaway, Hewlett, Fire Island Beach, Wading River, Smithtown, Amagansett, Montauk and doubtless at other places, but reports have been recently received that in winter time, when the owners are not there to guard them, the trees are often cut down or mutilated beyond recovery! It can be obtained from the Hicks Nurseries at Westbury, Long Island, and they have several hundred plants, two to three feet high, at four dollars each or thirty dollars for ten. According to Britton and Brown, *Ilex opaca* Ait. is said to grow "in moist woods" from Southern Maine to Florida, west to Pennsylvania, Missouri and Texas, and to be most abundant near the coast, though known to occur sparingly on Table Rock, North Carolina, at three thousand feet elevation. According to reports, the largest commercial supplies are now coming from Texas, and are being shipped all over the country by the car-load, in such large quantities that it is only a question of a few years when this tree will be almost or quite locally exterminated.

Professor M. T. Cook states that in Ocean and Monmouth County, New Jersey, holly is still found wild in sufficient quantity to make it worth while for local residents to supply it in small quantities to local dealers, but the State Department of Conservation assures us that at Mount Holly, where it used to be abundant, only a few stunted trees remain. A nurseryman, who propagates and sells them, is handicapped by the quarantine law against the Japanese beetle. There are a few fine trees in cultivation of both the American and English holly at Burlington and Princeton, New Jersey, and perhaps there may still be some wild trees back of Sandy Hook and in the Highlands, where we know of a few belonging to the Misses Haynes. Dr. Harshberger, whose interest in historical trees is well-known, states that in Bucks and Delaware Counties, Pennsylvania, and in New Castle County, Delaware, there are still some wild plants at a number of places. Mr. E. Morell of Harrisburg, Pennsylvania, who conducts a "Holly Tree Nursery" at Southern Pines, North Carolina, finds that seedling holly trees for growing in the northeastern States must be propagated from

seeds from northern localities. The young trees grown from seeds from southern localities are not hardy when set out at the North.

In Rhodora[1] the range of the holly in New England is indicated. The old Essex County station at Cape Ann has been gone since 1880, "but in some localities it is still abundant and fruits well; whereas in other localities there are only scattering and badly-hacked trees." It occurs also on Cape Cod and sparingly on Nantucket and in the southeastern part of Rhode Island, but in Connecticut seems to be lacking. Dr. Nichols says: "There is no question in my mind but that the holly was formerly native in Connecticut, but while I have been on the lookout for it for many years and have talked with various of the Connecticut botanists who should be in position to know, I have yet to get track of a single living wild specimen, growing either native or as an escape."

In Maryland and Virginia the holly and laurel are gathered and brought in to market, largely by the negro population, and Maryland is the first State to recognize the danger and pass a law which imposes a fine of from five dollars to twenty-five dollars or imprisonment for cutting laurel, holly or Christmas trees from any private land, without the consent of the owner.

The laurel is used in summer as well as in winter and the wild cherry is a good substitute for decorating fruit-stands, etc.

The New England Society for the Protection of Native Plants has sent out a circular letter to all the churches urging them not to use the mountain laurel (*Kalmia latifolia*) for their Christmas decoration and suggesting as a substitute garlands of white pine, as the timber will be benefited by having the lower branches cut. Unfortunately the gum that is exuded from the pine is a serious drawback to its becoming a popular substitute for the laurel but perhaps the hemlock (*Tsuga canadensis*) would be better.

The winterberry, also of the holly family, (*Ilex glabra*) has approximately the same range though extending farther inland away from the coast. It is known in Nova Scotia in the vicinity of Halifax, then skips two hundred and seventy-five miles to Cape Ann, Massachusetts, and ranges southward to Florida and

[1] Rhodora **16**: 163–165. 1914 and **21**: 126. 1919.

Louisiana. It also has suffered a good deal from vandalism, though it is not collected in such large quantities as the holly. It too is difficult to germinate, is sown by birds and prefers moist sandy localities.

In a leaflet on "Our Christmas Greens" by Beatrix Farrand, the well known garden expert, it is stated that a commercial box of holly, such as we see standing outside of the florists and grocer's shops, "contains a minimum of six hundred years of growth and that one poor yard of laurel-roping uses up at least twenty years of growth! As all of this comes from wild sources and often without the permission of the owner, it is only too true that our woodlands are being butchered to make a Christmas Holiday, and that we are each of us directly responsible for our share of this destruction." Mrs. Farrand suggests that we use more tubbed or potted trees of holly and there are a number of substitutes which may be had by the discriminating. Small evergreens in pots, *Ardisia crenata*, with its bright red berries, the Jerusalem cherry, *Solanum Pseudo-capsicum*, dwarf orange trees and the *Poinsettia* or mexican flame-leaf are all excellent substitutes and artificial imitations of the last may be had in a variety of styles and prices, as it is beginning to be recognized as the best and showiest "Christmas Flower." In Florida at Miami, where it grows out-of-doors, it is a most gorgeous Christmas tree.

There are a number of other species of the spurge family, *Euphorbiaceae*, which would be welcome and decorative. *Euphorbia heterophylla*,* the annual poinsettia, is easily grown from seeds and as a pot-plant. The scarlet-plume (*E. fulgens*), is one of the most graceful of plants, and *Adenorima punicea* or *Euphorbiodendron* would be a most popular addition if it could be introduced from Jamaica where it grows wild. Wreaths of immortelles or wood fiber make very attractive decorations. Their too great brilliancy may be toned down by the addition of some artificial leaves and holly berries.

Holly seeds are said to be difficult to germinate and to require three to four years. We have some plants over a foot high grown from seed sown in 1920. It seems likely that the warmth of the digestive tract of birds is necessary to hasten germination,

* Addisonia 4: 77–78. Dec. 1919. Plate 159.

for in the New Forest in England holly trees have sprung up all around the base of the fine old beech trees, evidently sown by birds.

In the New York Botanical Garden we have tried planting holly, both American and English, without much success. One fine tree, over ten feet high, from the Andora Nurseries of Chestnut Hill, Pennsylvania, was planted in 1906; it has escaped injury so far, though a few sprays were taken last year. Holly is evidently slow in growth, but will stand judicious pruning, but it is particular about soil and exposure, so that it is advisable to study its habits and try to find suitable locations for planting, else the result will be disappointing. It is also to be remembered that holly is polygamous, often quite dioicous and that the staminate trees do not bear fruit, so it would be wise to plant several in a group.

E. G. BRITTON

WINTER LECTURES

Free lectures and demonstrations will be given by members of the Garden staff in the central display greenhouse, conservatory range 2, on Sundays at 3 o'clock during the entire winter. Those scheduled for December and January are as follows:

Dec. 3.	"Forest Cacti."	Dr. N. L. Britton
Dec. 10.	"Greenhouse Pests."	Dr. F. J. Seaver
Dec. 17.	"Warm-temperate Conifers."	Mr. K. R. Boynton
Jan. 7.	"Fruits and Seeds in Winter."	Dr. H. A. Gleason
Jan. 14.	"Cacti of the Atlantic Coastal Plain."	Dr. J. K. Small
Jan. 21.	"A Winter Study of Trees."	Dr. W. A. Murrill
Jan. 28.	"Tropical Orchids"	Dr. H. A. Gleason

Conservatory range 2 is situated at the eastern side of the Botanical Garden, north of the Allerton Avenue entrance. It is most conveniently reached from the Allerton Avenue station on the White Plains Extension of the subway from East 180th Street. Visitors coming by train to Botanical Garden station should inquire at the museum building.

NOTES, NEWS AND COMMENT

A large plant of *Yucca elephantipes* bloomed during the early part of October in range 2. A photograph of the plant with its large truss of creamy white flowers appeared in the Mid Week section of the New York Times of Oct. 5th.

In range 1 the interesting fruits of the granadilla, *Passiflora quadrangularis*, hanging on the vine in considerable quantity attracted the attention of visitors. The fruits are about the size and color of the familiar honey-dew melon.

Meteorology for October: The total precipitation for the month was 1.76 inches. The maximum temperatures recorded for each week were: *90° on the 5th*, 76° on the 9th, 77 ½° on the 17th and 67° on the 25th. The minimum temperatures were: 54° on the 4th, 36° on the 14th, *28° on the 21st* and and 32° on the 29th. The first freezing temperature of the autumn was on the morning of the 19th, when a temperature of 32° was recorded; the first killing frost was on the morning of the 21st.

ACCESSIONS

LIBRARY FROM MAY 1 — SEPT. 20

Allgemeine Gartenzeitung. Vols. 4–12, 14 24. Berlin, 1836–56.

AMES, OAKES. *Orchidaceae.* Fasc. 7. Boston, 1922. (Given by Prof. Oakes Ames.)

Anales del Instituto de segundo ensenanza de la Habana. Año 2. Habana, 1895, 96. (Given by Brother Leon.)

BAILEY, LIBERTY HYDE. *Cyclopedia of farm animals.* New York, 1922. (Given by The Publishers' Weekly.)

BAILEY, LIBERTY HYDE. *The principles of fruit-growing.* [Ed. 20]. New York, 1921.

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BAILLON, HENRI ERNEST. *Iconographie de la flore française.* 5 vols. Paris, n. d.

BEDFORD, DUKE OF (HERMAND ARTHUR RUSSELL), & PICKERING, PERCIVAL SPENCER UMFREVILLE. *Science and fruit growing.* London, 1919.

Berichte der deutschen botanischen Gesellschaft. Vols. 1–38. Index, vols. 1–20. Berlin, 1883–1920.

BOWER, FREDERIC ORPEN. *Botany of the living plant.* London, 1919.

BOWER, FREDERIC ORPEN, KERR, JOHN GRAHAM, & AGAR, WILFRED EADE. *Lectures on sex and heredity.* London, 1919.

BRIQUET, JOHN, & CAVILLIER, FRANCOIS. *Emile Burnat.* Genève, 1922. (Given by the authors.)

CANDOLLE, AUGUSTIN PYRAMUS DE. *Mémoires et souvenirs . . . publiés par son fils.* Genève, 1862.

CASTLE, WILLIAM ERNEST, & OTHERS. *Heredity and eugenics.* Chicago, 1917.

CHILD, CHARLES MANNING. *Individuality in organisms.* Chicago, 1915.

COLTMAN, ROGERS CHARLES. *Conifers and their characteristics.* London, 1920.

COULTER, JOHN MERLE, & COULTER, MERLE CROWE. *Plant genetics.* Chicago, 1922.

CRAMER, PIETER JOHAN SAMUEL. *Kritische Ubersicht der bekanneta Fälle von Knospenvariation.* Haarlem, 1907.

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14 photographs of cacti. (By exchange with the United States National Museum.)

2 photographs of *Ostrya Knowltoni* from Utah. (By exchange with the United States Forest Service.)

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1 colored lantern slide of *Cypripedium reginae*. (Given by Dr. George E. Nichols.)

1 colored lantern slide of *Phyllitis Sclopendrium*. (Given by Dr. R. C. Benedict.)

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41,300 specimens of marine algae—The F. S. Collins herbarium. (Given by Dr. N. L. Britton.)
69 specimens of orchids from the Philippine Islands. (By exchange with Mr. Oakes Ames.)
483 specimens of flowering plants from Massachusetts. (By exchange with Harvard University.)
4 specimens of coralline algae from Bermuda. (Given by Professor W. A Setchell.)
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3 specimens of water-fern—*Ceratopteris deltoidea*—from Porto Rico. (Given by Mrs. F. S. Earle.)
30 specimens of flowering plants from North America. (By exchange with the United States National Museum.)
2 specimens of *Petalostemon* and *Trepocarpus* from Alabama. (Given by Dr. R. M. Harper.)
45 specimens of flowering plants from tropical America. (By exchange with the United States National Museum.)
14 specimens of marine algae from Bermuda. (Given by Dr. A. B. Hervey.)
9 specimens of flowering plants from New Brunswick. (By exchange with Harvard University.)
13 photographs of American plants. (By exchange with the United States National Museum.)
42 specimens of mosses from British Columbia. (By exchange with Mr. William R. Taylor.)
75 specimens of mosses from Alaska. (By exchange with Mr. William S. Cooper.)
6 specimens of mosses from Alaska and Hawaii. (By exchange with Mr. P. O. Schallert.)
13 specimens of mosses from North America. (By exchange with Dr. A. J. Grout.)
35 specimens of mosses from Venezuela. (By exchange with Mr. H. Pittier.)
70 specimens of mosses from Mount Ranier, Washington. (By exchange with Dr. J. B. Flett.)

54 specimens of mosses from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)
112 specimens of mosses from Porto Rico. (Collected by Mrs. N. L. Britton.)
3 specimens of mosses from Florida. (By exchange with Mr. Severin Rapp.)
7 specimens of mosses from eastern North America. (By exchange with Mr. Edwin B. Bartram.)
16 specimens of mosses from Alaska. (By exchange with Mr. Charles W. Thornton.)
24 specimens of grasses from Saint Croix, West Indies. (By exchange with the United States Department of Agriculture.)
10 photographs of cacti. (By exchange with the United States National Museum.)
53 specimens of sedges from Long Island, New York. (By exchange with Mr. W. C. Ferguson.)
12 specimens of flowering plants, mostly *Ophrys Smallii*, from North Carolina. (Given by Mr. A. D. Huger.)
5 specimens of grasses from Shusham, New York. (Given by Mr. Frank Dobbin.)
25 photographs of cacti. (By exchange with the United States National Museum.)
4 specimens of flowering plants from Long Island, New York. (By exchange with Mr. Roy Latham.)
275 specimens of flowering plants for the local herbarium. (Given by Mr. W. C. Ferguson.)
260 specimens of flowering plants from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)
164 specimens of ferns from Polynesia and Micronesia. (By exchange with the United States National Museum.)
87 specimens of flowering plants from New Hampshire. (By exchange with Harvard University.)
20 specimens of marine algae from Orient, New York. (Given by Mr. Roy Latham.)
23 specimens of algae, mostly marine, from Whidbry Island, Washington. (By exchange with the United States National Museum.)
377 specimens of flowering plants from Maine. (By exchange with Harvard University.)
32 photographs of cacti. (By exchange with the United States National Museum.)
60 specimens of mosses from North America. (By exchange with Harvard University.)
1 specimen of moss from Seattle, Washington. (By exchange with Dr. J. W. Bailey.)
32 specimens of mosses from the British West Indies. (By exchange with Professor Edward B. Chamberlain.)
67 specimens of mosses from the United States. (By exchange with the United States National Museum.)
9 specimens of mosses from Cuba. (By exchange with Brother Leon.)
26 specimens of mosses from California. (By exchange with Dr. C. F. Millspaugh.)

50 specimens of mosses from North America. (By exchange with Professor J. M. Holzinger.)
12 specimens of mosses from Trinidad. (By exchange with Mr. W. E. Broadway.)
91 miscellaneous specimens of mosses. (By exchange with the Natural History Museum, Vienna.)
2 specimens of mosses from the West Indies. (By exchange with Professor L. H. Bailey.)
2 uncolored lantern slides of orchids by Dr. E. T. Wherry. (Given by Mrs. N. L. Britton.)
3 colored lantern slides of flowering plants by L. W. Brownell. (Given by Mrs. N. L. Britton.)
1 uncolored lantern slide. (Given by Mrs. N. L. Britton)
2 uncolored lantern slides of leaf hopper and its destructive action. (Given by Bureau of Entomology, Washington.)
13 colored lantern slides of orchids by Dr. E. T. Wherry. (Given by Mrs. N. L. Britton.)
1 specimen of *Phyllosticta nicotiana* from North Carolina. (Given by Dr. F. A. Wolf.)
30 specimens, "Fungi Dakotenses" fascicle 21. (Distributed by Dr. J. F. Brenckle.)
61 specimens of parasitic fungi collected by Dr. J. N. Rose in South America. (By exchange with the United States Department of Agriculture.)
1 specimen of *Ceriomyces parasiticus* from Van Cortlandt Park, New York. (Collected by Mr. R. S. Williams.)
108 specimens of fungi from the western United States. (Given by Dr. J. R. Weir.)
1 specimen of *Calvatia* from Salvador. (By exchange with the Smithsonian Institution.)
1 cotype specimen of *Polyporus pini-ponderosus*. (Given by Dr. J. R. Weir.)
555 specimens of fungi from North America. (By exchange with the United States Department of Agriculture.)
6 specimens, *Amauroderma subrenata*, *Coriolus brachypus*, *C. membranaceus*, *C. sector*, *Hypolyssus Montagnei*, and *Pterula* from British Guiana (By exchange with Prof. F. L. Stevens.)
2 specimens of *Monadelphus caespitosus* from Missouri. (By exchange with Dr. Arthur S. Rhoads.)
1 specimen of *Geaster triplex*? from Connecticut. (By exchange with Mr. Warren Travell.)
1 specimen of *Lentinus levis* from New York. (By exchange with Mr. John A. Kingsbury.)
1 specimen of *Peckiella viridis* from Massachusetts. (By exchange with Mr. Warren Travell.)
1 specimen of southern tuckahoe from South Carolina. (By exchange with Dr. Mel. T. Cook.)
1 specimen of *Wynnea americana* from Pennsylvania. (By exchange with Dr. L. O. Overholts.)

6 specimens of fungi from New York. (By exchange with Mr. John A Kingsbury.)

1 specimen of an agaric from Utah. (By exchange with Prof. A. O. Garrett.)

1 specimen of *Lepiota cretacea* from Ohio. (By exchange with Mr. Edward C. Volkert.)

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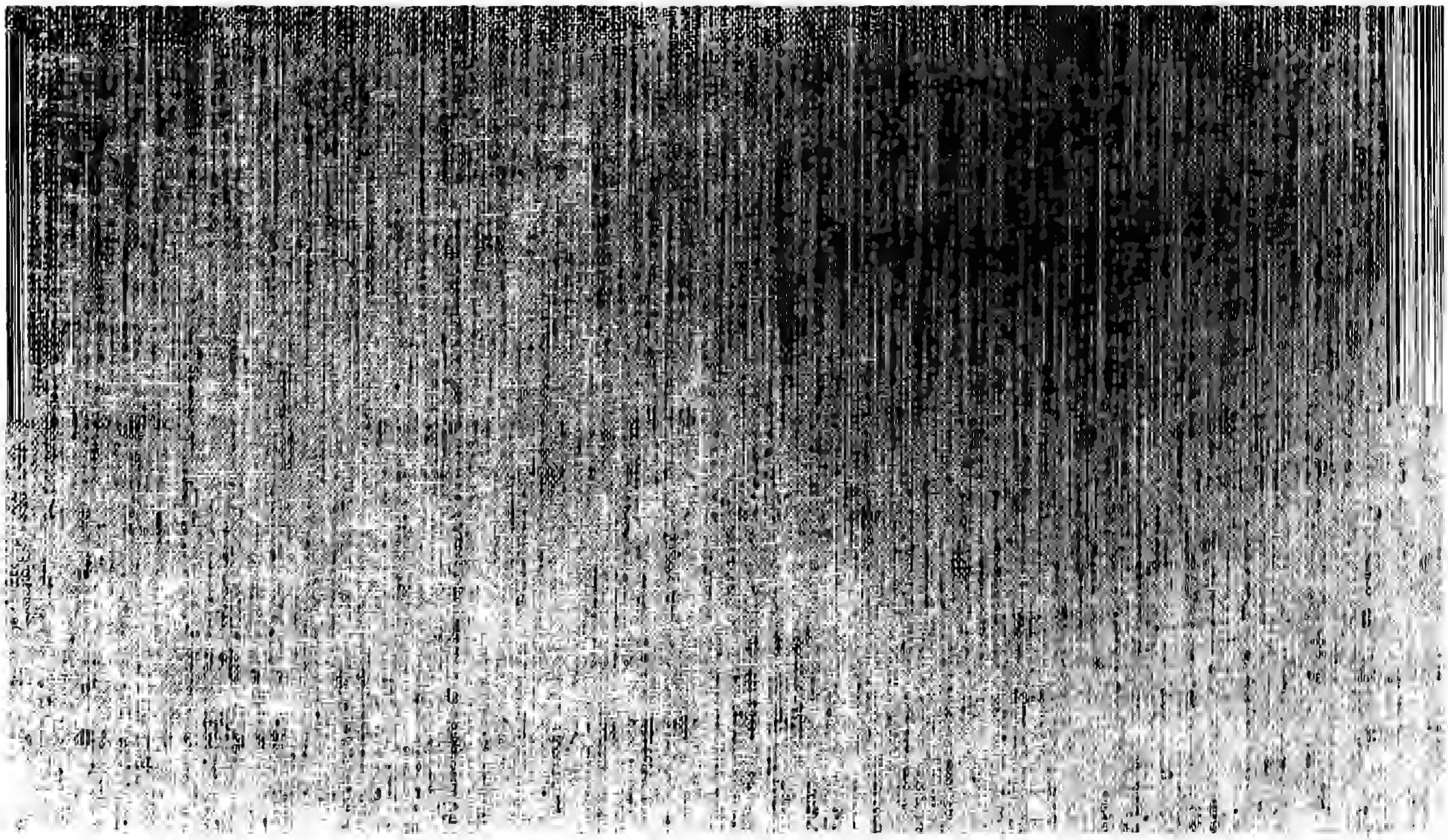

JOURNAL

OF

THE NEW YORK BOTANICAL GARDEN

VOLUME XXIV, 1923

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The New York Botanical Garden

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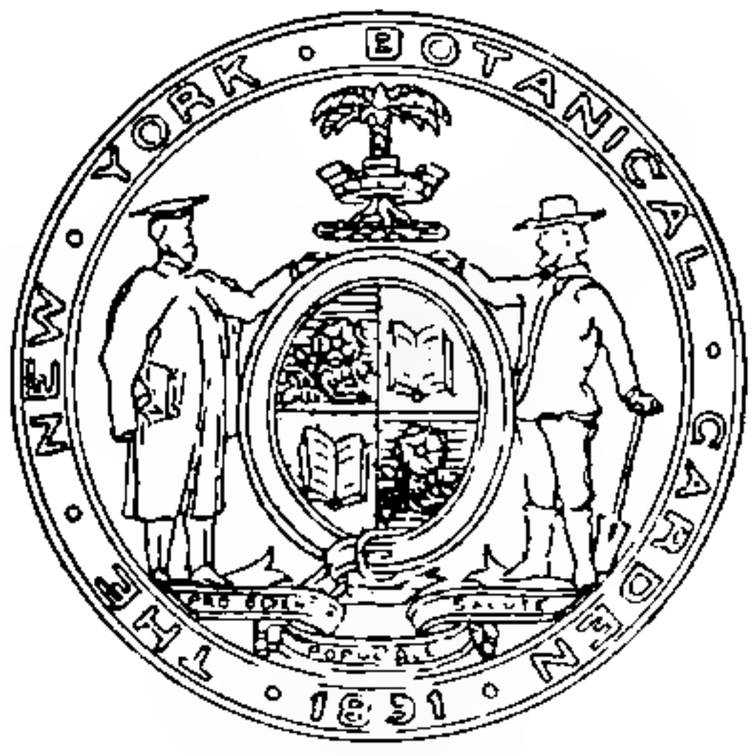

VOLUME XXIV

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LAND OF THE QUESTION MARK

REPORT ON EXPLORATION IN FLORIDA IN DECEMBER, 1920

A glance at the map of the continental United States will show that Florida—the most southern State of the Union—suggests the shape of an interrogation mark. There is a fitness in this. The geographical position of the State, particularly of that great tongue of land thrust southward hundreds of miles into tepid seas, implies a plant-covering unique in North America, and thus makes the question mark—so far as botanists are concerned —both a challenge and an invitation. Not one, but myriad questions, moreover, are suggested by that note of interrogation.

In continuation of exploration and investigations mentioned previously on these pages, the writer arranged to spend the earlier weeks of December, 1920, in further search and study among the plants of Florida and contiguous territory.

The particular objects of our search were coonties (*Zamia*), spider-lilies (*Hymenocallis*), lilies (*Crinum*), prickly-pears (*Opuntia*), and wild-pepper plants (*Peperomia*), while special information was sought regarding certain geological formations and their plant coverings.

Incidentally, en route, the great panorama extending from New York to Florida suggested many problems, and, in some cases, also offered the solution.

The meadows and hills of the northern part of the Coastal Plain, considering the long-extended warm fall, and little cold weather after the late and really only slight frosts, were desolate.

Examples of the more northern wild plants that end their active annual existence, regardless of seasonable variations from year to year, were numerous. In other words, the native plants of all climes have averaged up seasonal habits through ages of existence in a particular environment. This routine they follow almost regardless of meteorological variations that seem decidedly marked to us.

The obviousness of this seasonal change, of course, varies with latitude. In the tropics it is least conspicuous; often, indeed, although vegetation is legion, variation is nil. In temperate regions it is most conspicuous; while at the poles, for the lack of vegetation, again it is nil.

Most of our commonly cultivated plants, whether they were originally from high or from low latitudes, are much less regular in their seasonal habits. We are familiar with cultivated plants whose behavior is governed not so much by the seasons, except that growth is impossible in freezing weather, as by the irregularities of conditions in the growing season.

For example, pansies (*Viola*), sweet-alyssum (*Koniga*), portulaca (*Portulaca*), and dahlias (*Dahlia*), in a temperate region, will flourish well into a prolonged autumn or early winter, while their native associates will promptly fade and die, or die down to the underground parts regardless of the prolonged warm weather.

Grasses, also, often furnish conspicuous examples of this phenomenon. In the winter we may frequently notice a field or a hillside covered with a native grass, brown and apparently lifeless, while nearby a lawn planted with some cultivated grass will be green and flourishing.

This rule obtains not only among ornamental plants, but also among those that have been cultivated by man for more substantial reasons. Of particular interest in this connection are many of the homely naturalized "weeds" which have been associated with the cultivation of staple crops for ages. They are, in temperate regions, not only the first to appear with the advent of spring, or earlier, but also the last to survive in the fall or even overlap into the winter. Examples may be found among annuals, biennials, and perennials. Thus, sheep-sorrel (*Rumex Acetosella*), chickweed (*Alsine media*), pepper-grass (*Lepidium virginicum*), none-such (*Medicago Lupulina*), wood-

sorrel (*Xanthoxalis* spp.), St. John's wort (*Hypericum perforatum*), carrot (*Daucus Carota*), ground-ivy (*Glecoma hederacea*), dead-nettle (*Lamium amplexicaule*), speedwell (*Veronica* spp.), plantain (*Plantago* spp.), dandelions (*Leontodon Taraxacum*) may often be found alive in the fall after their associates have been killed by frost.

Near the eastern end of the Mason-Dixon line the poor or impoverished hills suddenly presented to view three prominent, green elements—the dark-green poverty-pine (*Pinus virginiana*), the paler-green pitch-pine (*P. rigida*) and the deep-green calico-bush (*Kalmia latifolia*). The more fertile hills supported a growth of deciduous-leaved shrubs and trees. Their former greenery, however, was completely ravished and formed a deep layer of browned leaves on the ground. The monotony of the landscape was broken here and there, however, by a dash of dull-green, furnished by the persistent foliage of the commonly cultivated and widely naturalized Japanese honey-suckle (*Nintooa japonica*).

A question occurred to the writer: Do the more infertile or impoverished soils of the cool-temperate regions support a more abundant flora of evergreen broad-leaved shrubs and trees than do the more fertile soils? It seems that they do. The explanation seems to be this: The plants growing in the rich soils take up mineral matter and store the maximum amount in the leaves in one season, after which the leaves must fall. In the poorer soils the plants take up and store the mineral matter much more slowly, so that two or more seasons elapse before the leaves are so stocked with it that they must fall.[1]

South of the Mason-Dixon line additional green was in evidence on account of the persistent leaves of the willow-oak (*Quercus Phellos*). The swamps appeared less desolate, too, because of the sweet-bay (*Magnolia virginiana*) with its evergreen leaves which are deep green and glossy above and nearly white beneath. In a breeze these trees constitute the most conspicuous element in the landscape. This plant is gregarious, occurring mostly in colonies. The reason is not far to seek.

[1] See R. M. Harper, A Cross-section of northern Mississippi, Bull. Torrey Club **40**: 377–399. 1913; A Sketch of the Forest Geography of New Jersey, Bull. Geographic Soc. Philadelphia **16**: 107–124. 1918.

The fruits and seeds, being fleshy and heavy, are not distributed by the winds, but remain where they fall. Such seedlings as survive, therefore, continue to grow near the parent stock. There was one tree, particularly in the uplands, which was conspicuous, although devoid of foliage. This was the Catawba tree (*Catalpa Catalpa*), or more popularly "the Indian-cigar," so called on account of the elongate pods which resemble cigars and which are persistent and conspicuous after the leaves fall. This tree, indigenous in the Gulf States, and contiguous territory, is widely cultivated and often spontaneous, being self-sown northward. Unlike the sweet-bay, this tree is not gregarious. Its seeds are widely dispersed by the winds and the progeny of a single tree may spring up and develop in a swamp, on a river bank, on a roadside, on a hillside, or in a field. The trees usually occur singly, not in colonies.

Virginia presented a continued desolation of scenery. Yet this was less pronounced, thanks to the more abundant pine trees in the landscape and the greater persistence of dead leaves clinging to the hardwood trees and shrubs.

The change from fall to winter vegetation became still less apparent in the Carolinas and Georgia. Here the additional kinds of pines and the live oaks gave added variety to the landscape, and here also the ripe leaves still clung to the shrubs and trees in the numerous low hammocks and river-swamps with flashes of warm color. The pale yellow of the tulip trees (*Liriodendron*), the deep yellow or orange of the sweet gums (*Liquidambar*), the dull red of the maples (*Acer*), the brighter red of the sour gums (*Nyssa*) were arranged in endless variety. Some leaves, moreover, were still green—on the water oak (*Quercus nigra*), the willow oak (*Q. Phellos*), and the laurel oak (*Q. laurifolia*).

Nor were the pinelands, although nearly flowerless, without color. They were furnished in varying shades of red by the turkey oak, or the black-jack of the south, (*Quercus Catesbaei*), and the upland willow oak (*Q. cinerea*).

In the hammocks and gum-ponds, trees of various habits grew. Some with erect branches and narrow crowns, others with spreading branches and wide crowns. There the mistletoes (*Phoradendron flavescens* and *P. macrotomum*) flourished, not, however, in the same regions. The relation of birds and

seed dispersal was very evident in the case of the mistletoe. It is a well-known fact that birds are fond of the white berries of this woody parasite, also that birds usually perch high. Consequently, it is generally among tree tops that our mistletoe occurs.

Technically, the season was autumn, but for some plants it was spring. The cypress trees, those of the river cypress (*Taxodium distichum*) and particularly those of the pond cypress (*T. ascendens*) were in full bloom. The drooping, often clustered, reddish staminate aments of these deciduous-leaved evergreens were frequently copious and conspicuous in the otherwise barren tree tops.

On approaching and entering Florida, marshes formed a prominent element in the landscape. These, first in order, were often fluffy masses of white from the persistent cottony pappus of the fruiting heads of the groundsel-bush (*Baccharis*), and second in order were the yellow-green clumps of willows (*Salix*), which were variously placed among the masses of groundsel-bushes. Trees or clumps of trees of the southern red-cedar with its somber-green often stood near the edges of the marshes.[1]

In connection with the southern red-cedar (*Sabina silicicola*) in the region under consideration, F. André Michaux,[2] referring to its growth in the maritime regions, says:[3]

"When unincumbered in the sand, as in the middle of the islands and on the borders of the narrow sounds that flow between them and the main, it is 40 or 50 feet in height and 12 or 13 inches in diameter; but it would be difficult at present to find stocks of this size northeastward of the river St. Mary within the ancient limits of the United States."

[1] **Sabina silicicola** Small. *Juniperus barbadensis* C. Mohr, not L. *Sabina barbadensis* Small, in part. Distinguished from the northern *Sabina virginiana* by the large staminate aments and the small ovoid cones.

[2] François André Michaux (1770–1855) accompanied his father (André Michaux, 1746–1802, author of the *Flora boreali-americana*) to America in 1785, although only fifteen years old at that time, and remained here for five years. He was in America again, with Charleston as his headquarters, from October, 1801, until March, 1803, traveling meanwhile from New York to South Carolina, and in Kentucky and Tennessee. He traveled even more extensively in the eastern United States, from Maine to Georgia, and west to the Ohio, from 1806 to 1809. He was particularly interested in American forest trees, and is best known for his elaborate publications devoted to them. He was one of the two passengers from Albany to New York, on the first trial trip of the first Fulton steamboat, in 1807.—John Hendley Barnhart.

[3] The North American Sylva 2: 554 and 556. 1819.

In the early days the use of red cedar in shipbuilding was only second to that of live oak (*Quercus virginiana*). Writing of the available supply, Michaux says: "The reproduction is too trifling to be mentioned in comparison with the consumption in the parts of the United States at large, . . . Recourse is now had to the coast of East Florida between the St. Mary and St. John, which will soon be exhausted in its turn."

During the twentieth century the center of the red-cedar harvest was gradually moved southwestward until it reached the Gulf Hammock and contiguous territory on the western coast of Florida. For many years large trees were available. Today the supply of red-cedar for making the lead pencils comes from trees with trunks about six inches in diameter. Although the supply of trees could easily be kept up by planting in its native habitat, no effort is made thus to replenish the supply.

The following brief notes on a three weeks' botanical excursion in winter will show that even at that season of the year the Land of Flowers holds much to attract and offer the botanist. Several thousand miles of northern Florida and the peninsula were traversed, mainly by motor-car. This extensive itinerary was made possible through the continued personal interest of Mr. Charles Deering. To this advantage should be added the facilities for study and experimentation in Mr. Deering's reservations at Buena Vista and at Cutler, Florida.

NORTHERN FLORIDA

Upon reaching Jacksonville we at once proceeded westward to Tallahassee. There, two days were devoted to field work in company with the state geologist, Mr. Herman Gunter, and the geographer, Dr. Roland M. Harper.[1] Tallahassee, as the capital

[1] Roland McMillan Harper (1878—) was born at Farmington, Maine, and his home for many years has been at College Point, New York, but much of his life has been spent in the three southeasternmost states of the Union. Graduated from the University of Georgia in 1897, he began his professional work in science in 1903, when he became forestry collector for the Georgia Geological Survey. In 1905 he took the degree of Ph. D. at Columbia University, and since that time has been almost continuously in the service of the state geological surveys of Georgia, of Alabama, or of Florida, as botanist or geographer, or both. He has explored all parts of these three states with much thoroughness. In recent years he has devoted more time to geographical and statistical studies than to botany.—J. H. B.

of Florida—first a territory, and a state since 1845—is nearly a century old. The region, however, was settled even earlier in a sporadic sort of way. Tradition has it that the Spaniards occupied it about three hundred years ago. This is likely, for the region is on the old Spanish Trail, which ran westward from St. Augustine. It was cleared of Indians, as was also the gulf strip shortly after Florida was ceded to the United States by Spain, but the intervening country remained in undisputed possession of the Indians for about two decades longer. Thereafter Tallahasseee became the capital of the state, and it was the rendezvous of the successful planters of the vicinity. Among these were botanists and plant-lovers, the most prominent among whom was H. B. Croom.[1]

Well-known early botanists were not as numerous in that region, to be sure, as they were in the settlements of the Atlantic seaboard; but many of their successors, too numerous to mention here, spent more or less time at Tallahassee, Florida's picturesque capital.

The yards and public grounds in Tallahassee give the town the stamp of age. In them you will find many old specimens of

[1] Hardy Bryan Croom (1797–1837), was born in Lenoir County, North Carolina. He graduated at the University of his native state in 1817, and was admitted to the bar, but practiced his profession for only a short time; he married about 1820, and made his home at New Bern. About 1832 he rented a plantation in Florida, on the west bank of the Apalachicola River, opposite Aspalaga, and it was in this vicinity that he discovered *Tumion* (*Torreya*) and *Croomia* early the following year. In 1837 he purchased the former home of Joel Roberts Poinsett (1779–1851), for whom the genus *Poinsettia* was named, in Charleston, South Carolina, intending to make it his permanent residence. During the summer of the same year he brought his family, as was his custom, to New York City, and in October sailed for Charleston in the steam-packet "Home." This was a new vessel, the finest that had ever been built for the coastwise service; but it was wrecked off Ocracoke Inlet, south of Cape Hatteras, on the second day out (October 9, 1837), and Croom and his entire family, wife, three children, and maid, perished. His charming personality and scholarly attainments intensified the sorrow of Torrey, Gray, Chapman, and his other botanical friends. Besides his catalogues of the plants of New Bern, Croom had contributed several papers to the American Journal of Science and Arts, and one to the Annals of the Lyceum of Natural History of New York. Death, however, claimed him when he seemed on the very threshold of an unusually productive botanical career. A monument to the memory of Croom and his family stands in front of the Episcopal church at Tallahassee.—J. H. B.

cultivated shrubs and trees, both native and exotic. A list, made several years ago, by A. M. Henry, Assistant State Chemist, of the woody plants within the city limits of Tallahassee included about sixty-four species growing naturally, mostly natives, thirty-six species native elsewhere in middle Florida, but in cultivation in Tallahassee, and one hundred and twenty-seven exotics brought from other States and from foreign countries.

Among the more noteworthy shrubs and trees may be mentioned: torreya (*Tumion taxifolium*), cluster-flower yew (*Cephalotaxus drupacea*), umbrella-fir (*Sciadopitys verticillata*), yellow-wood (*Podocarpus* sp.), Washington-palm (*Neowashingtonia robusta*), century plant (*Agave americana*), creeping-fig (*Ficus pumila*), star-anise (*Illicium anisatum*), holly-barberry (*Odostemon Neubertii*), photinia (*Photinia serrulata*), crown-of-thorns (*Parkinsonia aculeata*), Otaheita-walnut or wood-oil tree (*Aleurites moluccana*), pistacio (*Pistacia vera*), silk-oak (*Grevillea robusta*), Japanese-aralia (*Fatsia japonica*), strawberry-tree (*Arbutus Unedo*).

Tallahassee is in a phytogeographic region, called the Tallahassee Red Hills, which is characterized by numerous steep hills, lakes and ponds, sometimes fed by sluggish streams, and by the absence of rivers. About one hundred and thirty woody plants, including about twenty vines, and several hundred herbs, comprise its flora. Prominent among the trees are the short-leaf pine (*Pinus echinata*), red-oak (*Quercus triloba*), live-oak (*Q. virginiana*), hickory (*Hicoria alba*), sweet-gum (*Liquidambar Styraciflua*), and dogwood (*Cynoxylon floridum*).

This region is fertile for Florida. Cultivated by the later Indians and doubtless by the older aborigines, perhaps one quarter of it is still under cultivation today. But, of course, most of the forest has been cut away and the land is exposed, so it is not a particularly prolific field for botanical collecting in winter.

West of this region, towards the Ocklocknee River, is a part of the Middle Florida Hammock Belt. This comprises flat woods, red hills, and minor plant-associations, with rivers, but no lakes. The plant-covering comprises about one hundred and eighty-odd woody plants, including about a dozen vines, and several hundred herbs, but fewer of these than in the Tallahassee Red Hills. The greater number of woody plants repre-

sented in the Middle Florida Hammock Belt is due to the extensive hammocks and swamps.

The singular plant of the pine woods west of the Ocklocknee River was a wild-indigo (*Baptisia simplicifolia*). Some of our many wild-indigoes have quite wide geographic ranges, but most of them are more restricted. This one, however, is one of the rarest, being known to grow in only three adjoining counties—Gadsden, Leon, Wakulla. Its leaf-structure is peculiar, for instead of having a compound blade with three leaflets, it has a simple broad leaf-blade. In one of them, moreover, *Baptisia perfoliata*, the leaves are perfoliate, that is, the stem runs through the lower part of the blade. Notwithstanding the lateness of the season, the plant in question still held its fruit and its foliage was blackened, as is often the case in the wild-indigo in an aged or dried condition.

Two kinds of trees attracted our attention in the river-swamp. They were both broad-leaved. One, the river-birch or red-birch (*Betula nigra*), growing there near the southern end of its geographic range, still held its leaves and showed its new aments ready to expand with a decided rise of temperature in the coming spring. The other tree was devoid of leaves, but laden with fruits; and as these were bright-red, the tree was a most striking object. It was the Ogeechee-lime (*Nyssa Ogeche*). This tree is known to grow naturally only in the low country of South Carolina, Georgia, and Florida. The fruits, which are red, resemble small plums and may be used as a substitute for lemons or limes in making an acid drink; they also make a good preserve.

The broad swamp of Little River is a natural palm garden. Two kinds of palms are abundant and grow intermixed. The blue-stem[1] (*Sabal minor*) has an underground stem from the tip of which the crown of leaves and inflorescence arises. Some of the plants were fruiting, and raised their clusters of drupes far above the leaves on stalks six to eight feet tall. This plant —a relative of the cabbage-tree (*Sabal Palmetto*)—is wholly unarmed and cattle often browse on the leaves.

The other kind of palm was the more abundant. Often it formed almost impenetrable thickets, not only on account of

[1] For a history of the blue-stem see Journal of the New York Botanical Garden 23: 161-168. 1922.

VICINITY OF NEWPORT, FLA.—A pecan tree (*Hicoria Pecan*) in winter condition, with clusters of a parasite, the southern mistletoe (*Phoradendron macrotomum*) on the upper branches and streamers of an air-plant, long-moss (*Dendropogon usneoides*) on the lower branches.

its numbers, but also on account of its formidable stems. These rising to three or four feet above the ground are armed, like porcupines, with slender needles a foot or more in length, whence the common name—needle-palm. These needles, by the way, are tightly woven in the leaf-sheaths and persist for many years. Yet this is our most graceful native palm and deserves to be more widely cultivated for ornament. It has no close relatives in the United States.

Aside from the palms, the river-swamp had a rather desolate appearance. The broad-leaved trees were in their resting stage and the herbaceous plants had mostly disappeared for the winter. A bright exception was a beautiful little gentian which was clustered beneath the plants of the needle-palm and there showed its deep sky-blue flowers in their prime when the flowers of all other herbs had disappeared. Like some other herbs, particularly in peninsula Florida, this gentian (*Dasystephana Elliottii*) is a winter-bloomer.

South of Tallahassee the land falls away rapidly until it stands at sea-level at St. Marks, which is about twenty-six miles distant. We drove southward on the water-shed between the St. Marks and the Wakulla Rivers.

Much of the country about Tallahassee, as we have mentioned, has long been denuded of its forest covering; but proceeding southward, we began to see timber again. It is mostly black-jack woods. Southward the trees become taller and taller until a considerable distance from the city a normal growth of trees appears. There we were in the Bellair Sand Region. The land is mostly undulating. There are numerous depressions, but springs and streams are scarce. The most conspicuous plant covering is long-leaf pine and oaks—black-jack or turkey-oak. The general plant covering is made up of about seventy different kinds of shrubs and trees, including a half dozen vines, and about two hundred and fifty herbs. The leaves of the black-jacks (*Quercus Catesbaei*), throughout its range, were ripened and more or less colored with red, but south of Tallahassee the red becomes intense. As we continued southward it seemed almost as if we were penetrating a sea of fire.

The former settlement of Bellair was a health resort in the early part of the last century. There the Tallahasseeans betook themselves to escape malaria. Just why the malarial mosquito

was less plentiful in the Bellair Sand Region than in the Tallahassee Red Hills has not yet satisfactorily been explained.

Continuing southward we came to the open pine woods in the western tip of the Gulf Hammock Region. Newport was achieved in due time and there we secured our first bulbs of a spider-lily (*Hymenocallis*). Growing in company with the spider-lily was a new eryngo related to *Eryngium synchaetum*, which is the source of the black-drink of the Seminole Indians. The plants were only in fruit. Many trees about Newport, especially the cultivated pecan trees, were badly infested with mistletoe (*Phoradendron macrotomum*). The mistletoe was in both flower and fruit. Some trees were so copiously laden that they seemed about to succumb. The parasite here concerned has broader leaf-blades and more elongate and interrupted spikes than the species further northward in the Coastal Plain, from which it was recently separated. Thus, together with another and rather recently discovered species of *Phoradendron* in southern Florida, we have three species in the southeastern States.

A few miles south of Newport near the confluence of the St. Marks River and the Wakulla River lies the town of St. Marks. This settlement dates back to the early Spanish occupation. Much of botanical interest occurs in the region thereabouts. There was a fine development of a willow (*Salix longipes*) along the river. This willow was discovered there in the earlier part of the last century. It has not a very extensive geographic distribution, although for some time willows occurring as far north as the middle states and the trees of southern peninsular Florida were erroneously referred to it. The wax-myrtle (*Cerothamnus ceriferus*), too, was abundant and, curiously enough, was copiously infested with a parasitic vine, a dodder (*Cuscuta glomerata*).

Having gone down the region of the St. Marks River from Newport to its mouth, we returned through the region of the Wakulla River. We crossed to the western side of the river at the lower bridge. In the broad river swamp we again encountered plants of a spider-lily (*Hymenocallis*) and also a gigantic marsh fleabane (*Pluchea*), with large leaves, the lower ones sometimes six or seven inches long, and very large cream-colored heads in a terminal cluster. Thence we passed into the Wakulla Hammock

Region. This country is undulating. It is largely clothed with long-leaf pine and black-jack, which grades into hammocks composed of numerous hardwood deciduous and evergreen trees and shrubs. The woody elements of the flora comprise over one hundred and ten species, including a half dozen vines, and about one hundred and fifty herbs. The Wakulla River rises abruptly as an immense spring, perhaps the largest in the world, excepting the Everglades and Silver Spring. This spring is over four hundred feet in diameter and over eighty feet deep. We crossed the river again a few miles from the spring, and in the channel collected large bulbs of lilies (*Crinum*).

Having apparently exhausted the possibilities of acquiring further objects of our search in that region, the following morning about three o'clock found us on our way to new fields. The main object was to view, at least, a sparsely settled territory near the Gulf Coast where northern Florida and the peninsula merge.

Dark night still prevailed when we reached Greenville, en route to Perry. The only possible way to reach Perry, thirty miles distant, before late in the day, was by motor-car. Two negroes, also bent on reaching Perry, and the writer pooled their cash and asked the railroad station watchman to procure a car. A light soon appeared in a distant window and later an ubiquitous "Ford" disturbed the quiet of the night. As soon as it arrived, we took possession and were on our way to our destination. South of Greenville, just before dawn, we crossed a belt of the Middle Florida Flatwoods and north of Perry we crossed into the Gulf Hammock Region.

This phytogeographic region is larger than those described before. The country is flat or gently undulating and much of the underlying limestone is exposed on the surface. Pine woods are the prevailing type of plant cover. The streams and sloughs are bordered by hammocks. In all of them are present about one hundred and twenty-five woody plants, including a dozen vines, and between three and four hundred herbs.

Dawn came before we reached Perry. Near the dividing line of the two floral areas just mentioned we found quite unexpectedly one of the objects of our search, the coontie (*Zamia integrifolia*) or, in other words, the zamia so common in the pinelands of the Everglade Keys at the southeastern extremity

of the peninsula growing in northern Florida beyond the limits of the northwestern extremity of the peninsula. Specimens brought from north of the town were found growing in the yards of Perry. Associated with the *Zamia* in the gardens was an atamosco-lily (*Atamosco candida*), then in full flower. This is a native of the Andes of South America. It has snow-white, somewhat starry flowers, and is thoroughly naturalized in parts of southern Louisiana. Both these plants seemed to be immune to the ill effects of cold weather. Furthermore, we have received several reports to the effect that the *Zamia* was growing in yards at De Funiak Springs, western Florida. This town is much further north than Perry. It is in about the same latitude as the mouth of the St. Mary's River or the northern boundary of the Atlantic side of the State. Where these specimens were obtained is still a mystery. So far, several scouts sent into the unsettled country between De Funiak Springs and the Gulf Coast have failed to report any wild *Zamia*.

Two other plants attracted our attention at Perry. A blanket-flower (*Gaillardia pulchella*), which may have escaped from culti-vation, and the epiphytic Florida-moss (*Dendropogon usneoides*), which decorated the electric wires in and about the town. Attractive asters and goldenrods of unusual aspect occurred in the pinewoods and low hammocks, but, unfortunately, either lack of time or opportunity forbade the collecting of specimens. The country from Perry to Newberry was traversed by rail. The greater part of the railroad right-of-way lies in the Gulf Hammock Region mentioned on a preceding page.

The higher pinelands were nearly or quite devoid of flowers, but not devoid of color, for the persistent pappus of various composites furnished that. Particularly prominent, especially where the plants of a given species were massed, was the yellow pappus of the golden-aster (*Chrysopsis*) and the white of the flat-topped *Carphephorus*. Especially were the plumose calyxes of "summer-farewell" (*Kuhnistera pinnata*), which simulates a composite in habit, there dispersed in large areas of pale purple, while the ubiquitous dog-fennel (*Eupatorium*) often formed a gray mist on the landscape. The hammocks, likewise, were without evident flowers, except asters, which were tantalizingly conspicuous, but nevertheless attractively colorful on account of the variously hued persistent leaves. The ponds and ditches

were the floriferous spots in the landscape and they varied greatly. Some were filled with several species of rather hardy tickseeds (*Coreopsis*), the yellow heads of which were visible from great distances. Other ponds, perhaps with deeper water, were filled with pickerel-weed (*Pontederia*) and maiden-cane (*Panicum*). The frosts had "burned" the leaves of the former brown and those of the latter yellow. Herbaceous plants were not the only inhabitants of ponds. Shrubs often predominated. Two closely related kinds were evident, but they were seldom associated in the same pond. The candle-bush (*Sebestiana ligustrina*), with its stiff broom-like stems and branches, appeared in strong contrast with the pliable and irresponsible looking queen-root (*Stillingia aquatica*), with its sprawling branches and discolored upper leaves and yellow spikes.

Toward the Suwannee River the land became higher and we entered a portion of the Peninsular Lime-sink Region. The saw-palmetto (*Serenoa repens*) and the cabbage-tree (*Sabal Palmetto*) were in evidence, usually growing in clumps as they do further south in the peninsula. The environs of Old Town gave the impression of having been settled and used long ago. The natural configuration of the land, making it suitable for cultivation and living, was doubtless appreciated by the aborigines ages ago as well as by the modern Indians and white men. In Florida many such advantageous places were chosen for the sites of forts, and these often later developed into towns and cities.

The hammocks along the Suwannee River were composed largely of water-oak (*Quercus nigra*), water-hickory (*Hicoria aquatica*) and water-birch (*Betula nigra*); the latter there reaching its southern geographic limit. East of the Suwannee River the rolling land supported a scrub-like plant association with quite stunted woody vegetation. This soon gave way to black-jack ridges, which in turn gave way to mixed pine and hardwoods.

Near Newberry, *Zamia integrifolia* again appeared, and while motoring from Newberry to Gainesville it was noticed at several localities.[1] During a brief stop at Gainesville the most noteworthy plant observed was *Zamia umbrosa* growing in a garden

[1] There we found *Zamia* several years ago. See Journal of The New York Botanical Garden 19: 74. 1918; 21: 28. 1920.

on East Main Street. This was evidently brought from the hammocks east or southeast of Gainesville. This species apparently does not occur west of the town. The ranges of the two species meet or overlap east of Gainesville, for there *Zamia integrifolia* is found in the pinelands, while *Zamia umbrosa* occurs in the hammocks, which are a prominent feature in that part of the State, whereas they are not in that west of Gainesville.

From the vicinity of Tallahassee to Gainesville, many young relatively low live-oak trees, with greatly elongate, even rope-like declining branches, were noticed. Of course, we had noticed such trees in other parts of the State, but heretofore their significance was not considered. However, the many examples observed during the excursion set us to thinking on the subject. We had previously studied the several forms of the live-oak as regards habit, foliage, and fruits. Now, as far as habit is concerned, there are two prominent types of the live-oak. One grows with uplifted arms, so to speak. The other doesn't. The habit the tree will have at maturity is evident in its youth. The particular form referred to above is the one which at maturity becomes the well-known type of Florida live-oak—the sort usually photographed to show massiveness—with a short, very thick trunk which is divided into massive spreading and declining limbs, which form a crown much wider than high.

Having traversed this virgin botanical field, we made haste to return to Jacksonville. Winter weather had ravished vegetation and only in the wet and protected places did we observe flowers such as tickseeds, water-lilies, and spatter-docks.

Three days were devoted to the coastal region within a radius of about thirty miles of Jacksonville. While frosts greeted us each morning, yet there was more than enough of botanical interest to occupy our attention, especially near the coast line.

Jacksonville, first settled a little over a century ago, is on the site of Cow Ford, or, in Indian parlance, Wacca Pilatka. Here the King's Road and old highway connecting the Georgia frontier with St. Augustine, crossed the St. John's River. Today highways as well as railroads still meet here to diverge toward many points of the compass.

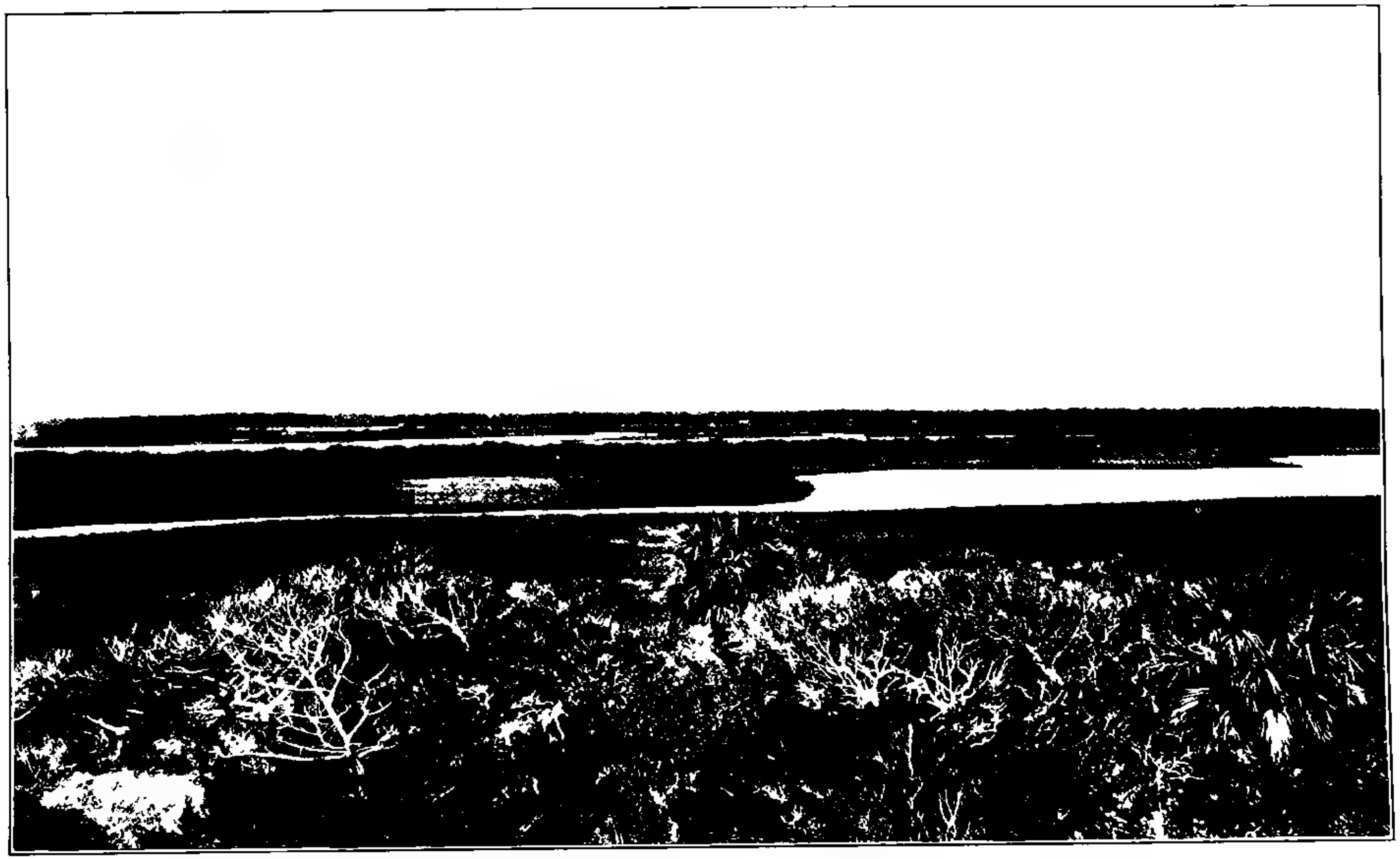
Our first day in that region was devoted to St. Marys on the Georgia frontier. This town, once a prominent port and a

naval station, is situated on the northern bank of the estuary of the St. Mary's River, about nine miles from the Atlantic Ocean. Were it not for a small part of the Okeefenokee Swamp that separates the head-waters of the Suwannee River and the St. Mary's River, all of Florida south of a narrow semicircular divide that surrounds the drainage basin of the Okeefenokee Swamp, would be an island. The sources of these two rivers almost meet in southern Georgia and, furthermore, the head-waters of some of their tributaries rise very near each other in northern Florida.

About a century ago two new plants were discovered at St. Marys: The one a spider-lily (*Hymenocallis crassifolia*), the other a hop-trefoil (*Ptelea Baldwinii*). We had hoped to rediscover these, but the early and repeated killing frosts had ravished all such vegetation. Their rediscovery is still on our list of the almost innumerable tasks for the future. In spite of the early cold weather, some hardy bright-flowered asters and goldenrods were in bloom. The persimmon (*Diospyros*) was devoid of foliage but laden with delicious fruits. In addition to the ever-green oaks, some of the heavier-leaved trees in the hammocks still retained their leaves. Among these the chinquapin (*Castanea pumila*) was prominent. This is one of the trees that ranges from the higher mountains to the salt marshes of the coast. Chinquapins were wanting, though perhaps the wild animals had appropriated the crop. However, hickory nuts were plentiful and were rapidly falling from the large trees. The nuts were interesting in that the seeds had already begun to germinate in the shells which were just falling out of the husks.

In spite of the adverse conditions, flowers were not wanting on some precocious shrubs. The numerous yellow balls of the opoponax (*Vachellia Farnesiana*) filled the air with their violet fragrance. The less pretentious squaw-huckleberry or buck-berry (*Polycodium caesium*) showed its numerous pale bells in the thickets, while the humble coral-smilax (*Smilax pumila*) trailed on the ground hiding its yellow-green flowers and its coral-red berries beneath the persistent fuzzy leaves.

Cacti did not fail us. The genus *Opuntia* appeared near the salt marshes in three forms: first, the crow-foot prickly-pear (*Opuntia Tracyi*); second, Pollard's prickly-pear (*O. Pollardi*), and, third, a large-jointed depressed prickly-pear of uncertain



ON JUPITER ISLAND, FLA.—A characteristic view, looking westward, along a great part of the eastern coast of Florida. Eastward lie the active dunes, as described at the end of this article. Scrubby vegetation of the western slope of the dunes in the foreground. Lagoon with marshes and water-ways in the background. The pinelands of the mainland are in the distance.

relationship. The two former grew in the hammock, while the latter occurred on the dune-like edges of the salt-marshes.

St. Marys was laid out with a view to preventing congested streets. All the streets are wonderfully wide and shaded with large live-oaks (*Quercus virginiana*) and red-cedars (*Sabina silicicola*). The trees are copiously draped with Florida-moss (*Dendropogon usneoides*). We learned of a new use for this wide-spread and abundant southern plant. On one of the main streets two small children were pulling some large streamers of this air-plant from the trees and feeding it to a cow which devoured large quantities with apparent relish. A feature of the public works of the town is the rock-work of the city park, which is built of rocks that were brought there as ships' ballast from many parts of the world.

The second day was devoted to the region about the mouth of the St. John's River and the dunes south of it. As we approached Atlantic Beach prickly-pears began to come into evidence and on the sandy plain back of the barrier dunes we ran into veritable thickets of a prickly-pear different from any of the other kinds we had previously found in Florida or elsewhere. Associated with the prickly-pear was a remarkable thistle—a species of *Cirsium*. Only the basal rosettes of leaves were present, but they were much in evidence. A single rosette was usually of sufficient size to fill an old-fashioned bushel basket, and the large leaves were of a light gray color and very spinescent.

The dunes between Atlantic Beach and Pablo Beach were mostly well shrub-clad. Palms were represented by the cabbage-tree (*Sabal Palmetto*) and the saw-palmetto (*Serenoa repens*). The hard-wood shrubs were chiefly wax-myrtle (*Cerothamnus*), several oaks (*Quercus*), toothache tree (*Zanthoxylum*), several hollies (*Ilex*), Florida-privet (*Forestiera*), and French-mulberry (*Callicarpa*). All these shrubs were often bound into an almost impenetrable thicket by the rampant branches of two kinds of bamboo (*Smilax Beyrichii* and *S. laurifolia*) and two grape-vines (*Vitis caribaea* and *Muscadinia Munsoniana*).

The oaks were often fantastic objects as a result of the action of the almost continuous winds from the ocean. The more striking form assumed by several kinds of oaks might be called the umbrella or mushroom form. The trunks were only about

six feet tall with the branches spreading horizontally from the top of the trunk for a distance of twice the length of the trunk.

One of our rarest sunflowers (*Helianthus carnosus*) grew among the shrubbery. This plant was collected only once before.

At noon we drove north to Mayport, which is situated on the southern side of the mouth of the St. John's River. The objects of our search there were wild-pepper plants (*Peperomia*) and prickly-pears. We were disappointed in our search for these particular plants, except for the discovery of the cockspur prickly-pear (*Opuntia Tracyi*).

There were sand-dunes aplenty, but shell-mounds were scarce and low. The remaining chance for securing our desiderata lay in the territory on the northern side of the river's mouth. Securing a motor-boat, we crossed over to Pilot Island. Success was almost coincident with our landing in the island. On the barrier beach we stumbled on two new kinds of prickly-pears representing two distinct groups of the genus *Opuntia*. The one is of uncertain relationship with remarkable top-shaped fruits which are broadly rounded at the apex instead of umbilicate as in the fruits of most of our species. The other falls next to the little cockspur prickly-pear (*Opuntia Drummondii*), but it has joints up to a foot or more in length. The joints are just as loosely articulated as in its small relative, but the fruits are several times larger and many-seeded. The flowers of both the species are yet to be seen.

From Pilot Island we crossed over to Fort George Island. We were soon on the kitchen-middens of the aborigines and we anticipated the finding of the wild-pepper plant we sought. However, our first discovery was another kind of prickly-pear. The plants had long and narrow joints, and in habit resembled more closely than any of our other prickly-pears one we found on Lignum Vitae Key of the Florida Keys.

We now turned our attention to the higher shell-mounds where we soon found the typical cockspur prickly-pear with joints mostly less than half an inch in diameter and with very long spines. The greater part of the shell mounds had been taken away for road-making and the mixture of disturbed shells and humus yielded little of interest in the way of plants. However, our search on the hammock floor of the undisturbed parts of the mound soon was rewarded by the discovery of the wild-

pepper plant we sought. It was on shell heaps at the mouth of the St. John's River, most likely on this very mound, that this curious little plant was discovered in Florida by Nathaniel Ware[1] in 1817. After this early discovery about half a century passed before a second species of *Peperomia* was found in Florida. Within the next three decades three additional species of *Peperomia* were found. Thus, there are now five different kinds known to grow in the State. They fall into three distinct groups. Some of the species are strongly intrenched, others are in danger of extermination. Curiously enough, this fate threatens the two endemic species, particularly the one under consideration, This plant grows, as far as we now know, only on the refuse heaps left by the Florida aborigines. It is known only from three localities, the mouth of the St. John's River, the region of the Halifax River, and the fern grottoes in Citrus county. It begins to look as if this curious plant had some part in the economy of the ancient inhabitants of Florida, perhaps in their ecclesiastical economy, just as the mistletoe and other plants did in the case of the ancient and modern peoples—savage and civilized—of various parts of the Old World and the New. Whatever may have been its relation to the lives of these old people, the removal of their kitchen-middens for road-making materials seriously threatens its existence.

Wandering through the hammock on the shell heaps were a number of marsh tackeys. These are semiwild horses, rather small, but active, strong, and of considerable physical endurance. They live in the marshes of the sea islands of the South.

The early morning of the third day found us a second time on our way to the estuary of the St. Mary's River. This time, however, its southern shore was our objective. The woods between Jacksonville and Yulee were desolate. Several miles east of Yulee flowers began to appear, sparingly, however.

[1] Nathaniel A. Ware (1780–1854) is said to have been a native of Massachusetts, but most of his life was spent in the southern states. He studied and practiced law in South Carolina, but settled at Natchez, Mississippi, in territorial days (before 1817), and there amassed a considerable fortune. In later years he lived at Philadelphia and Cincinnati, and he died at Galveston. His interest in the natural sciences was well known; Nuttall described many new species of plants collected by him in East Florida and West Florida, and dedicated to him the cruciferous genus *Warea*.—J. H. B.

On the upper end of Amelia Island, near Fernandino, saw-palmetto (*Serenoa repens*) appeared in quantity, and elder (*Sambucus intermedia*), both sporadically in flower. Acres of *Aster exilis* grew in and about the marshes. On the higher land fine hammock covered the sand. The hickory trees were copiously infested with mistletoe. Oaks were often dominating elements in the hammocks—live-oak, water-oak, willow-oak, and laurel-oak. There were many young live-oaks with the long rope-like branches mentioned on a preceding page. Nor was pineland wanting on the island. Much of the lower and more level portions are pine-clad, particularly about the middle of the island. Towards the southern end the hammock growth seemed more varied, and much red-cedar was present. The cedar trees were laden with fruits and the staminate aments for the coming season were about ready to shed their pollen. In addition to the saw-palmetto, the cabbage-tree (*Sabal Palmetto*) was present, although rather sparingly.

The hammock had quite a summery appearance. In addition to the evergreen oaks and magnolias, such leathery-leaved trees as red-bay (*Tamala littoralis*), devil-wood (*Osmanthus americana*), holly (*Ilex opaca*), and horse-sugar (*Symplocos tinctoria*) greatly modified the aspect of winter, while masses of the French-mulberry (*Callicarpa americana*) lent much color by its strings of bead-like clusters of bright purple fruits. The giant trees, aside from the live-oaks, were sugar-berries (*Celtis mississippiensis*), sometimes with warty prickle-armed trunks two or three feet in diameter.

Among the few herbaceous plants in evidence, the dog-fennel (*Eupatorium capillifolium*) and the groundsel-bush (*Baccharis glomeruliflora*) were in flower. The other groundsel bush (*B. halimifolia*) was conspicuous on account of its cottony fruiting heads.

Westward from the island lay extensive marshes. These had the general aspect of the Everglades, but their plant covering was a marsh-grass (*Spartina*) and not saw-grass (*Cladium*). It was while we were viewing these marshes that our eyes fell on the prize of the day—a giant prickly-pear, apparently never before collected. It was characterized then by the very large joints with relatively short spines, and large angular-turbinate fruits with very small seeds. The flowers were not observed. So much for the interior of Amelia Island.

The active sand-dunes and their flanking hammocks held much of interest. The hammock is stunted, wind-worn and gray-green. Hollies, oaks, and cedars comprise much of its vegetation and they hold the sands firmly in place. But the active dunes allow little vegetation to interfere with their movements. They are picturesque and grotesque—topographical hobgoblins, as it were. They move about there and when they choose, covering houses, railroad structures, and other objects for a while and then passing along and releasing the objects they have buried.

Few plants survive on these shifting sands. The Spanish-bayonet (*Yucca aloifolia*), saw-palmetto (*Serenoa repens*), cabbage-tree (*Sabal Palmetto*), and wax-myrtle (*Cerothamnus ceriferus*), singly or associated, may be observed on the tops or sides of the hillocks in separated clumps, but always huddled together—hugging one another, so to speak, like frightened children—in seeming realization of their precarious existence. And not without reason. A prostrate individual or a whole clump indicates the ultimate fate of those still standing.

Altogether this dune country suggests a miniature Sahara, except that the oases are mostly on the elevations instead of in the depressions.

JOHN K. SMALL

(To be continued)

CONFERENCE NOTES FOR NOVEMBER

The November conference of the Garden staff and registered students was held in the museum building on Wednesday, November 1. The program was as follows:

"Exploration in Florida in the Spring of 1922."—Dr. J. K. Small.

"Bolivian Species of Vernonia."—Dr. H. A. Gleason.

Dr. Small in his talk on exploration in peninsular Florida and on the Florida Keys in the spring of 1922 illustrated the results by specimens and by photographs. The main results were grouped under: (a) noteworthy extensions of the geographic ranges of rare species, (b) the endemic and otherwise interesting flora of kitchen-middens, aboriginal village sites, and Indian burial mounds, (c) the tropical plant-covering of the kitchen-

middens of the eastern and western coasts, (d) the specialized and endemic flora of the ancient sand-dunes of the southern part of the lake region, (e) new species and new genera, and (f) the position of aboriginal village sites and the contents of burial mounds in relation to the recent subsidence of the Florida peninsula. A full account of this trip will be published in due time in the *Journal*.

Dr. H. A. Gleason spoke on the genus *Vernonia* in Bolivia, where 52 species are now known to occur. Included in this list are six new species, some of which were collected for the first time by Dr. Rusby or Dr. White during the recent Mulford Expedition to Bolivia, and some of which depend on new interpretations of material from earlier collections. The sections *Stenocephalum* and *Critoniopsis* are represented by a few species only, and the great bulk of the genus belongs to the widely distributed section *Lepidaploa*. Within this section, six minor groups may be distinguished by the characters of the inflorescence. Exploration of parts of Bolivia is still deficient, and it is quite probable that several Argentinian species may yet be found along the southern border, and many Brazilian forms in the eastern and northeastern portions.

NOTES, NEWS AND COMMENT

Meteorology for November: The total precipitation for the month was 1.08 inches, of which 0.05 inch (one half inch by snow measurement) fell as snow on the 27th and 28th. There was a snow flurry of a few minutes duration on the 24th. The maximum temperatures recorded for each week were 63° on the 1st, *68° on the 12th*, 66½° on the 19th and 59° on the 20th. The minimum temperatures were: 35° on the 2nd, 32° on the 10th, 32° on the 17th and *24° on the 26th*. The first ice of the autumn formed across the middle lake in the night following the 21st.

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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIV February, 1923 No. 278

JOURNAL

OF

The New York Botanical Garden

EDITOR

H. A. GLEASON

Assistant Director

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

VOL. XXIV February, 1923 No. 278

LAND OF THE QUESTION MARK

REPORT ON EXPLORATION IN FLORIDA IN DECEMBER, 1920.

(*Continued from last number.*)

DOWN THE EASTERN COAST

Thus three days were spent collecting on the recent and pleistocene geologic formations. The morning of the fourth day we started down the west side of the St. John's for southern Florida. The earlier half of the day was devoted to traveling over the miocene as far as Palatka, where we crossed to the eastern side of the river. The older geologic formations were the earlier cultivated lands, and thus they have lost much of their original flora, which, moreover, is less varied than that of the newer formations. One native plant, a goldenrod (*Euthamia minor*), was particularly conspicuous and lined the roadsides for many miles. Although the high lands were practically flowerless, the low hammocks along the streams were somewhat floriferous.

In the hammock of Black Creek we found very vigorous specimens of *Crinum*, which grew in company with other aquatics, such as spatterdock (*Nymphaea*), water-lily (*Castalia*), pickerelweed (*Pontederia*), and blue-flag (*Iris*). The wild-rice (*Zizania aquatica*), growing to a height of twelve feet, was also abundant. This striking plant ranges from the Hudson Bay region in Canada to the Gulf of Mexico. Its fruits furnished the American aborigines and the later Indians an important food, and it is much sought after by birds. The latter fact may account for its wide geographic distribution.

In a wet hammock south of Black Creek several tall asters and a yellow marigold were in full bloom. The noteworthy plant discovered there was a new alder (*Alnus*). It is related to the smooth-alder (*Alnus rugosa*), which ranges from northern Florida northward, but it has different leaves and smaller fruiting aments. Along our course, west of the St. John's, ferns, saw-palmetto, and "scrub" were scarce. After crossing the river at Palatka these came much more into evidence. Flowering herbs were scarce east of the river. Several asters were blooming in the pinelands and golden-buttons (*Actinospermum*) and and boneset (*Eupatorium*) were scattered through the various patches of the "scrub." Three palms, cabbage-tree (*Sabal Palmetto*), blue-stem (*Sabal minor*), and saw-palmetto (*Serenoa repens*) appeared along or near the creeks which emptied into the St. John's River. Of particular interest to us were some of the plants cultivated in the gardens in the towns we passed through. The native century-plant (*Agave neglecta*), which was probably brought from the coastal region, and the coontie (*Zamia umbrosa*), which is doubtless native in the hammocks of the region, should be recorded here.

Darkness overtook us midway between Palatka and De Land, but we continued on to Daytona. Almost impassable roads delayed us north of De Land, while, strange to record, fog delayed us between De Land and Daytona. The weather had become chilly and the moisture of the air overhanging the marshes and swamps condensed into terrestrial clouds, which hung a few feet above the ground, and were so dense that our spotlight would scarcely penetrate the fog. On this road, a much traveled highway, great caution had to be observed, therefore, in regard to speed.

At Daytona we crossed the Halifax River to the ocean and drove down the coastal sand-dunes for the distance of ten miles to Mosquito Inlet.

The magnificent development of dunes and their plant-covering was as impressive as ever, and again emphasized the unequaled opportunity they offered for exploration and study. Aside from the almost endless shades of green, the fruiting clumps of the groundsel-bush (*Baccharis*), although not pretty, together with the flowering and fruiting clusters of the tropical hemp-vine (*Mikania cordifolia*), lent "color" to the landscape

by its cottony or fluffy masses of pappus. The gray-beard lichen (*Ramalina usneoides*) too draped the trees, often simulating the bromeliad Florida-moss.

We were not long in finding prickly-pears. The first one encountered was the same as that we had found in such great abundance on the dunes at Atlantic Beach east of Jacksonville.

Although the plant covering of the dunes is mostly woody, herbaceous plants are not wanting, to say the least. In fact, in the summer season, when collecting in that region is for some reason denied botanists, the more humble plants must form a conspicuous element in the floristics. At the time of our visit two sages, the one red (*Salvia coccinea*), the other blue (*S. lyrata*), were flowering. The flowers of the latter species, which ranges as far north as the middle states, were of a much deeper blue than in the North.

An idea of the very spot we visited on the dunes is well expressed in some lines written from observation made there in December too, nearly a century and a half previous to our visit, by William Bartram.[1]

"The next morning, . . . , whilst my companions were striking our tent, and preparing to re-embark, I resolved to make a little botanical excursion alone: crossing over a narrow isthmus of sand hills, which separated the river from the ocean, I passed over a pretty high hill, its summit crested with a few palm trees surrounded with an orange grove: this hill, whose base was washed on one side by the floods of the Musquitoe river, and on the other side by the billows of the ocean, was about one hundred yards diameter, and seemed to be an entire heap of sea shells [kitchen-midden, of course]. I continued along the beach a quarter of a mile, and came up to a forest of the Agave vivipara [*A. neglecta*, referred to above] (though composed of herbaceous plants, I term it a forest, because their scapes or flower stems arose erect near 30 feet high): their tops

[1] William Bartram (1739–1823) was associated from childhood with the scientific work of his father, John Bartram (1699–1777), the first native American botanist. He accompanied his father to Florida in 1765, insisted upon remaining there, and settled as a planter on the St. John's River, where he stayed about two years. In 1772 he began the extensive journey in the Carolinas, Georgia and Florida, reported in his published "Travels." He was a botanical artist of much enthusiasm and considerable ability.—John Hendley Barnhart.

regularly branching in the form of a pyramidal tree, and these plants growing near to each other, occupied a space of ground of several acres: when their seeds are ripe they vegetate, and grow on the branches, until the scape dries, when the young plants fall to the ground, take root, and fix themselves in the sand: the plant grows to a prodigous size before the scape shoots up from its centre. Having contemplated this admirable grove, I proceeded towards the shrubberies on the banks of the river, and though it was now late in December, the aromatic groves appeared in full bloom. The broad-leaved sweet Myrtus, Erythrina corallodendrum, Cactus cochinellifer, Cacalia suffruticosa, and particularly, Rhizophora conjugata, which stood close to and in the salt water of the river, were in full bloom, with beautiful white sweet scented flowers."[1]

The orange-grove referred to by Bartram has mostly disappeared. The remains of the forest of *Agave* is still there, but the plants were not in flower during our visit. However, there were countless numbers of the little century plants referred to by Bartram. We carried many of these to southern Florida to grow and compare with plants of the same species as it grows naturally at Cutler. Bartram's sweet-myrtus is the writer's *Tamala littoralis*, his *Erythrina corallodendrun* is *E. arborea*, his *Cactus cochinellifera* is *Opuntia*, probably a new species referred to on a previous page, his *Cacalia suffruticosa* is doubtless *Garberia fruticosa*, which together with the other plants just mentioned we found in abundance. This seems to be the first reference to *Garberia* in botanical literature. The flower-head somewhat resembles that of a discoid cacalia, but the plant is not closely related to that genus. Bartram's *Rhizophora conjugata* represents the black-mangrove (*Avicennia nitida*) which we also found in that region.

Near Mosquito Inlet the vegetation on the northern side consisted of saw-palmetto (*Serenoa*), oaks (*Quercus*), dahoon-holly (*Ilex*), dune red-bay (*Tamala*), spice-tree (*Anamomis*), and a tallow-wood (*Dodonaea jamaicensis*). The discovery of the latter plant was a great surprise, as it had previously not been found north of the Miami region. It was very plentiful, and bore both flowers and fruits. Its seeds are eaten by birds. This fact may account for its distribution along the coast. It doubt-

[1] William Bartram, Travels, XV-XIX. 1792.

less occurs at other places between its known northern and southern geographical limits. Animal life was scarce. Only gigantic blue-birds and bald-eagles were in evidence.

We recrossed the lagoon at Port Orange, proceeded to New Smyrna, and crossed back again to the dunes south of Mosquito Inlet.

The marshes along the lagoon supported an extensive growth of the black-mangrove (*Avicennia*), which was simultaneously in flower and in fruit.

The wide dunes between the ocean and the lagoon had a more scrubby growth then those north of the inlet. The scrub-oaks and the saw-palmetto, all kept down to an equal height by the winds, formed great billows of various shades of green, the saw-palmetto giving the lighter shades. Toward the lagoon, however, there was quite an arboreal development of vegetation. It was a rather unusual, even unique, forest. The main hard-wood trees were the spice-tree (*Anamomis Simpsonii*) and the heath (*Xolisma ferruginea*). The trunks were tall and spindling and both clothed with smooth bark. Among them two tropical herbaceous vines were rampant—a hemp-vine (*Mikania cordifolia*) with deliciously scented flowers and fluffy fruit and a wild cucumber-vine with little yellow flowers and small specked cucumber-like fruits.

A curious phenomenon came to our notice here, and elsewhere as well: the tropical beggar ticks (*Bidens leucantha*) had become naturalized particularly on partly disturbed shell heaps. A common white butterfly was greatly attracted by the white flower-heads of this plant. On several occasions we were surprised to see a strange plant with exceptionally large and showy white flowers, only to find, upon closer observation, clusters of butterflies on the heads of this common weed!

These Florida shell-middens are extremely interesting from several standpoints. Their floristics should be made a systematic study by some one, for they support a more or less specialized vegetation. They are artificial objects or habitats and are fast disappearing, their flora being destroyed along with their disintegration. This phase was mentioned on a preceding page regarding the mounds at the mouth of the St. John's River. The great shell-heaps between Daytona and New Smyrna are fast being leveled, and with the process the rare wild-pepper plant

(*Peperomia cumulicola*) is disappearing. Little did the Florida aborigines imagine how valuable their refuse heaps would be to a successive race in making hard roads for automobiles in a land where rock was scarce or wanting.

In the hammock on the dunes south of Coronado we were surprised to meet a single large specimen of a spider-lily. Diligent search through the surrounding parts of the hammock failed to discover other plants. We await the flowering of this plant with much interest.

We recrossed the lagoon—Hillsboro River—to the mainland, and headed southward again. The highway swings away from the water from New Smyrna to the head of the Indian River, and there is little to interest the botanist there in winter, although, doubtless, the borders of the distant Hillsboro River would yield noteworthy plants even in the winter time. The road follows the upper Indian River from Titusville to Cocoa. Night overtook us at the latter place, where we stopped until morning. South of Cocoa the only showy herbaceous plant blooming in the "scrub" was an elegant mint, a new species of *Conradina*. Below the mouth of the Sebastian River the dunes were more floriferous, supporting a dozen different plants in flower. The most striking plant there was a new pinweed (*Lechea*). This represents the largest of our several known species. It is a very vigorous plant, an individual often being sufficient to make twenty full-sized herbarium specimens. The fruits are pear-shaped and nodding.

Near Vero we came upon acres of one of the plants we especially sought, a spider-lily. After collecting a large supply of bulbs, we went on to Vero. There we found fields of the narrow-leaved golden-rod (*Solidago angustifolia*) and the most showy golden-aster (*Chrysopsis*) we have seen. It probably represents a new species. We crossed the Indian River at Vero to the coastal sand-dunes. The marshes of the lagoon were carpeted with a pure growth of the saltwort (*Batis maritima*) of a most striking shade of green. The dunes there are densely hammock-clad. The outer (ocean) and inner (lagoon) sides comprise hardwood hammocks of many kinds of trees. The interior in most places is a solid cabbage-tree hammock. The cabbage-trees are of all sizes and conditions. Many are naked-stemmed, others are perfectly clothed with "boots" up to their crowns.

From St. Lucie Sound—the southern section of the Indian River—the ancient dunes began to rise in the form of giant billows of white sand. One of the many peculiarities of the floristics of these dunes is the occurrence of typically salt-loving plants growing on their dry tops just as vigorously as they do down by the salt water. Among these may be mentioned the sea-grape (*Coccolobis uvifera*), coin-vine (*Dalbergia Ecastophyllum*), prickly-pear (*Opuntia Dillenii*), and dildoe (*Acanthocereus pentagonus*).

On the high dunes about Hobe Sound the snow-white sand seems devoid of anything that would nourish a plant, but not only do the herbs, shrubs, and trees that constitute its natural plant-covering thrive, but some exotics, such as the Natal-grass (*Tricholaena rosea*) and the periwinkle (*Catharanthus roseus*) have taken possession of large areas of barren sand and often offer a perfect sea of color to the eye. Associated with these plants or alone are quantities of the white and pink plumes of *Thysanella* and the yellow tops of the golden-aster (*Chrysopsis pilosa*). The latter is a curious plant, for in its prime the lower half of the stem is clothed with dead black leaves and the upper half with vigorous bright-green leaves. However, these dunes often support only a stunted woody growth. The oak forests are sometimes only miniatures—knee-high—but the trees are full grown. Associated with these bright-green oaks is the yellow-green tallow-wood (*Ximenia americana*), which, there, is little or not at all higher than the oaks. The ponds and lagoons —really lakelets—of these sand hills have never been studied for their aquatic flora, yet this cannot fail to prove interesting.

At the Jupiter River the billowy sand-dunes stop abruptly, and flat pine woods extend for some distance southward from the southern side of the estuary. At the Jupiter estuary and at others along the lower eastern coast the tall and very showy rose-mallow (*Hibiscus furcellatus*) may be seen with its bluish-purple nodding flowers almost any time the year round.

Even the floristics of the roadside are not monotonous. Very often different plants, herbaceous or woody, had taken possession of the roadside, by sections, as it were. It often seemed as if nature had given special attention to the placing of the plants. Of course, this arrangement was due to the advent to various seeds or spores in the loose soil of the roadside and the subse-

quent survival of the progeny of a given kind able to hold its own on a given section of the roadside. Thus we found, among others, lining one or both sides of the highway, scrub-oaks (*Quercus*), groundsel-bush (*Baccharis*), dog-fennel (*Eupatorium*), swamp-bracken (*Blechnum*), broom-grass (*Andropogon*), gall-berry (*Ilex*), beggars-ticks (*Bidens*), willow (*Salix*), saw-palmetto (*Serenoa*), rosemary (*Ceratiola*), sedge (*Cyperus*), Para-grass (*Panicum*), Natal-grass (*Tricholaena*), and so the list might be continued.

Long before we reached our destination the sun sank below the western horizon. We were treated to a brilliant sunset, which, moreover, flung its color even to the eastern sky, simulating a sunrise. It looked for a few minutes as if our hopes would be realized at last—that we should have a twenty-four hour field-day of sunlight; but these hopes faded with the rapid flight of the double pageant in the sky. As usual in these latitudes, night fell swiftly.

Central Peninsular Florida

The little-known parts of the interior of the peninsula which we had formerly traversed proved so unlike other parts of the State that an extensive excursion there was planned and undertaken. Driving northward along the eastern coast by night, the early morning hours found us at Melbourne about midway between the northern and southern extremities of the mainland of Florida. At Melbourne we struck into the interior. Back of the settlement lie pine-woods and oak-woods. This region represents the known southern limit of the turkey-oak (*Quercus Catesbaei*) on the eastern coast of Florida. This, too, is just north of the divide, on the eastern coast, separating the sources of the north-flowing and the south-flowing streams.

Proceeding westward we came to a "scrub" ridge which, perhaps, was a series of active dunes when the land surface was less elevated and the St. John's River basin was a sea. The configuration of the land along the eastern coast suggests that at one time some of the stationary dunes and the shell-middens of the aborigines, now part of the mainland, were islands in lagoons or seas. West of the "scrub" ridge we passed through more low pinelands which then gave way to prairies, and we were soon in the upper water-shed of the St. John's River, which definitely

rises in Lake Hellen Blazes, just north of the Indian Fields, a few miles south of where we were traveling. The low hammocks on the eastern side of the prairie were filled with masses, often acres in extent, of the leathery shield fern (*Dryopteris gongyloides*). The fresh vivid green leaves of this fern were commonly about six feet tall. The edges of the hammocks and their natural ditches were lined with banks of yellow marigold (*Bidens coronata*).

Prairie now became dominant and we soon came to the St. John's River, a mere creek meandering through the flat marshes of the prairie. The prairie extends about eight miles west of the St. John's River. It is full of sloughs and pools. These were mostly the homes of saw-grass (*Mariscus*), water-lettuce (*Pistia*) and aquatic St. John's-worts (*Hypericum*). But it was the gigantic clumps of arrow-heads (*Sagittaria lancifolia*), cat-tail (*Typha angustifolia*), and "lilies" (*Thalia divaricata*) that were the prominent features on the dead level of the prairie west of the river. Far to the westward clumps of cabbage-trees (*Sabal Palmetto*) and pond-cypress (*Taxodium ascendens*) appeared. The tussocks among the palms and cypress trees were all small ferneries, while about these were growing four kinds of yellow tickseeds and marigolds (*Coreopsis* and *Bidens*).

West of the prairie the land rose and pine woods were the dominant plant association. The floral display there was not extensive, but a half dozen kinds of flowers were evident as we sped along. More prominent among them were the purple plumes of the false hound's-tongue (*Trilisa paniculata*) and the white starry corollas of the grass-pink (*Sabbatia Elliottii*).

We were now approaching the eastern side of the lake region. Ponds, lakelets, and lakes began to appear. Some of the shallow, smaller bodies of water were almost completely covered with a growth of floating-heart (*Nymphoides lacunosum*), which, with its round heart-shaped leaves and rotate white flowers, simulated miniature pond-lilies.

The first large body of water encountered was Alligator Lake beyond which we passed between Tohopehaligo Lake and East Tohopehaligo Lake, where we came upon the first series of "scrub" since we had left the eastern coastal region. Kissimmee at the northern end of Tohopehaligo was finally achieved, whence we drove northward to Orlando through a series of pine-

woods and black-jack (*Quercus Catesbaei*) ridges. After a night at Orlando we started on a westward course and were soon in a rolling country south of Lake Apopka comprising black-jack ridges and "scrub." Here some of the typical "scrub" plants of the eastern coast "scrub," particularly species of *Polygonella* and *Thysanella*, reappeared. The exceptional growth was large areas of the dune blueberry (*Vaccinium Myrsinites*) which grew in almost pure colonies about waist high.

We had thus far followed a kind of divide or water-shed with an east-west trend. In the depressions, if they were deep enough, lay beautiful lakes of clear water which appeared, as a rule, of a deeper blue than the sky, often of a very deep blue.

At the western side of the lake region we turned southward into the water-shed of the Withlacoochee River in order to cross some forty miles of unsettled country between Groveland and Lakeland. As we proceeded, the altitude gradually fell away to the crossing of the Withlacoochee. We passed over a series of hills or areas clothed with black-jack (*Quercus Catesbaei*), pine, and upland willow-oak (*Quercus cinerea*) until the land became low enough to support either cypress-swamps or deciduous hammocks. Few plants were in flower in the Withlacoochee water-shed. A blazing-star relative (*Carphephorus*) and golden-asters (*Chrysopsis*) were the more prominent kinds. On the higher ridges we found the low bay-berry or wax-myrtle (*Cerothamnus pumilus*) for the first time during the excursion. This shrub had started its growth for the coming season in a vigorous manner. The underground stem had already put forth single or clustered fleshy branches four to eight inches in length. These, of course, continue to grow and become woody and ultimately form the shrubby growth of the plant.

The swamp of the Withlacoochee River, well supplied with moisture and somewhat protected from low temperature, was quite floriferous. Water-plants and marsh-plants abounded. The pools and slow-flowing channels were filled with a small but showy arrow-head (*Sagittaria*) intimately mixed with colored bladder-worts—purple, *Vesiculina purpurea*, and yellow, *Utricularia inflata*. The latter plant had golden-yellow corollas an inch or more in diamater, two to three times the size of those of the more common large Florida bladderwort (*U. radiata*). The tiny yellow bladderwort (*Setiscapella subulata*) was plentiful on

the mossy banks and with it a relative, the butterwort (*Pinguicula pumila*), mostly in different shades of blue.

The largest development of peat-moss (*Sphagnum*) we have seen in Florida occurred in that swamp. We were disappointed, however, in not finding spider-lilies or crinums anywhere in the region.

Traveling southward, the country again gradually became more elevated and for many miles, more desolate, almost flowerless, and uninhabited. However, as soon as the rolling hills of the lake country were reached, settlements, as numerous in proportion as they were wanting since we left Groveland, appeared, and we passed through towns without streets and streets without towns! We now began to climb and descend hills or circle around them with usually a small or a large lake in view. This extensive series of lakes is situated on rather elevated land, some of the hills rising to more than two hundred feet in altitude. In fact, the region is an irregular plateau with rolling hills, where groves of the upland willow-oak often supplant those of the live-oak.

On coming out of the lower parts of the Withlacoochee watershed, palms—saw-palmettos (*Serenoa repens*) and cabbage-trees (*Sabal Palmetto*)—appeared. On the higher hills some flowers were blooming, particularly yellow-flowered kinds—St. John's-wort (*Hypericum*), St. Peter's-wort (*Ascyrum*), yellow-buttons (*Actinospermum*), and asters. The latter were mostly pink and purple kinds. Passing a chain of lakes—Agnes, Juliana, Arietta, Ariana—we entered the still higher country. At the first settlement of any size, Auburndale, two plants of special interest were found: The one in cultivation—the century-plant (*Agave neglecta*)—evidently brought there from the eastern coast; the other, a commonly cultivated composite—yellow-cosmos (*Cosmos sulphureus*), but widely naturalized in the pine woods. The conspicuous native flower was the yellow-button (*Actinospermum*). At Auburndale we turned eastward and traveled as far as Lake Alfred and Haines City. There we turned southward again and crossed the "Top of Florida"—Lake Hamilton. Thence we proceeded to Lake Wales, passed Crooked Lake, and about Lake Istopogayoxee areas of "scrub" began to appear.

In the northern part of this region pineland predominates. In the southern part there is much "scrub," clothing a series of

ancient dunes which were at one time, perhaps, on or near the shores of a shallow sea. At any rate, their floristics are now unique. There is much "scrub" in the State, but this region supports a number of not only genera, but also species of flowering plants that are not found elsewhere.

Near Lakes Damon and Pythias large areas of "scrub" were met with. The buds of perennial herbs and deciduous shrubs were ready to burst and the seeds of annuals were just sprouting. Comparatively little was in bloom, but panic-grasses (*Panicum*) were in evidence and quantities of a new genus, related to the whitlow-wort, grew all over the sand in dense bright-green cushions. Night was falling and we pushed on to Sebring.

There was an exceptionally heavy dew through the night and the following morning once more fog enveloped everything. The extensive areas of naturalized Natal-grass (*Tricholaena rosea*) on the sand-dunes simulated hoar-frost as a result of the dew on the fluffy inflorescences of the grass. We set out through the fog, which soon cleared away, for the settlement of Kuhlman, which is about a dozen miles south of Sebring. However, vegetation was wetter than we had ever seen it. The accumulation of moisture from the dew had neither wind nor rain to shake it off the herbage and it clung as a thick coat until the sun was well up in the sky.

Our objective was the old sand-dunes near Kuhlman. These form a divide—the waters, draining eastward into Lake Istokpoga, westward into a grass-slough about twenty-five miles in length, which is the headwaters of Fisheating Creek, and ultimately finds its way into Lake Okeechobee. Of course, the waters of Lake Istokpoga also reach Okeechobee through the Kissimmee River. At any rate this divide and several others in the vicinity furnish most interesting and prolific collecting grounds in the winter; what might be found there in summer when plants are, naturally, most floriferous, can only be imagined. Although it was winter, we found several dozen herbs and shrubs in flower.

Widespread plants, such as the blue-curls (*Trichostema dichotomum*), carpet-weed (*Mollugo verticillata*) and typical Florida plants, such as bush-clover (*Petalostemon Feayi*), froelichia (*Froelichia floridana*), umbrella-plant (*Eriogonum floridanum*) were everywhere on the sand hills. The large new pinweed

which we found on the old dunes near the eastern coast was growing there, and in addition another new pinweed. Among other new plants was a peculiar member of the knotweed genus *Polygonella*, with clustered wiry stems and basal acicular leaves, and a new member of the mustard family, a *Warea*. This genus was named after one of the early American plant collectors who visited northern Florida before it became part of the United States and discovered the genus *Peperomia* this side of the Gulf Stream, in northern Florida in 1817. The genus *Warea* is confined to Florida, except one species, which also occurs in Georgia. Up to about the end of the last century only two species were known. About that time another was discovered in northern Florida. Since our exploration of the State has been under way two additional species have been brought to light.

One remarkable phenomenon of these ancient dunes is the luxuriant vegetation they support, both herbaceous and woody in the snow-white sand, which seems to be entirely devoid of organic nourishment. In such an exceptional environment it is not strange that a peculiar flora exists and that forms different from those in other, even neighboring, formations are a prominent part of their floristics. There are not only endemic species there, but genera as well. One new genus has been referred to in a previous paper[1] and another on a previous page of this paper. A third one was found growing with the new species referred to in a preceding paragraph. It is related to the St. John's-worts (Hypericaceae), but it is quite different in habit from any of the genera of that family heretofore known.

We penetrated as far south into the sand hills as our motor would take us, and then returning to Sebring we struck out eastward for the Istokpoga and Okeechobee regions. At the eastern edge of the sand-dunes we found some of the rare plant we had collected in the forenoon down towards Kuhlman, and then we pressed on towards the prairies.

Prairie fires and subsequent rains had resulted in a fresh and brilliant green plant-covering against which the bordering hammocks and hammock islands looked black. The prairies were much less rich in flowering plants than the sand-dunes. The greenery was bespangled here and there with the white

[1] Journal of The New York Botanical Garden **21**: 48. 1920 and **22**: 38. 1921.

In hammock at Cutler, Fla.—The "trunk" of the native "banyan" (*Ficus brevifolia*). This fig-tree continuously extends its crown in an irregular and unmechanical manner. The branches send down aerial prop-roots in order to support the weight of the irregular and over-balanced growths. Sometimes this fig grows with a column-like trunk and a symmetrical crown.

stars of the meadow-pink (*Sabbatia Elliottii*), yellow-stars of golden-aster (*Chrysopsis Tracyi*), with clumps of the vivid yellow St. John's-wort (*Hypericum aspalathoides*), and the greenish-yellow rayless-goldenrod (*Chondrophora nudata*). On the margins of the prairies were great blackberry thickets or tangles. The vine-like branches grew to a height of four or five feet, when they toppled over and continued to lengthen. Thus were formed matted jungles of stems and branches that rose above the prairie level.

About the Kissimmee River we found large snapping-turtles, the first we had seen. They made the fifth kind we had observed. The others were the leather-back, the gopher, the green-turtle, and the common land tortoise. The "snappers" were probably disturbed by the exceptionally high water of the river, which flooded the causeway which crosses the wide flood-plain of the river between Fort Bassenger and the settlement of Bassenger.

Once across the Kissimmee we decided to make a bee-line for the eastern coast, instead of making a wide angle by running south to the head of Lake Okeechobee and then back northward to Fort Pierce However, less than a mile's travel brought us to impassable wet prairies, so we turned southward towards the Fort Bassenger trail and proceeded toward Okeechobee City that way.

The Okeechobee prairie was quite barren of flowers, except on an occasional oasis, so to speak, where palm trees, bayberry bushes and dwarf oaks grew. On one of these garden spots we found two kinds of asters, two goldenrods (*Solidago*), two golden-asters (*Chrysopsis*), two butterworts (*Pinguicula*) and *Garberia*, all in full bloom. But there a heavy rain set in and it was dark when we reached Okeechobee City. The rain continued—and so did we,—passing neither habitation nor inhabitant all along the many long miles to Fort Pierce, except four Seminole girls who rode three horses, and neither these Indians nor their mounts seemed to care how hard it rained.

The next day our course lay down the eastern coast. On the inland sand-dunes the prominent native plants, aside from the spruce-pine (*Pinus clausa*) were the shrub-rosemary (*Ceratiola ericoides*) and the dodder-like vine, *Cassytha americana*. The latter is essentially leafless and the former is as copiously leafy

in proportion as the cassytha is leafless—the plant is mostly leaves. The cassytha is considered to be a degenerate laurel. The rosemary should be treated as a degenerate heath, but it is usually more closely associated with plants near the spurges. The flowers and fruits are diminutive or depleted heath flowers and fruits. The fragrance of the herbage is that of some of the boreal heaths and the fragrance of the flowers is quite similar to that of some heath flowers, and also to that of the buckthorn (*Bumelia*). The cassytha—parasitic vine—appeared more rampant than usual[1] and had even infested the spruce-pine.

Two immigrants had often taken possession of the barren sands of the dunes, which are naturally devoid of any close ground cover. Some areas were densely covered with Natal-grass (*Tricholaena rosea*), others with periwinkle (*Catharanthus roseus*). To see the dark-green rosemary bushes (*Ceratiola*) arising out of a wine-colored sea of the Natal-grass or one of the varicolored flowers of the periwinkle was an incongruous sight.

We made a preliminary examination of the elevated cypress heads between Juno and Kelsey City.[2] These are curious cypress groves and would bear close examination when vegetation is active, instead of dormant as it was when we were there. New terrestrials were blooming, however. *Boltonia*, *Aster*, and *Eriocaulon* were represented among the herbs. The pond-apple (*Annona glabra*) and the cocoa-plum (*Chrysobalanus pellocarpus*) were the more common shrubs. The conspicuous elements, however, were the epiphytes. Air-plants and orchids were thickly placed on the cypress trees. Not less than eight kinds grew everywhere—seven air-plants (*Dendropogon usneoides*, *Tillandsia aloifolia*, *T. utriculata*, *T. fasciculata*, *T. Balbisiana*, *T. tenuifolia*, and *T. recurvata*) and one orchid (*Encyclia tampensis*).

The seedlings of oaks and other trees usually spring up unevenly and diverse in shape, so that the few that do survive are quite irregular in size and shape. However, near the shore of Lake Worth at Kelsey City, we found the exception to this rule. On the sandy slope seedling live-oaks had sprung up and grown to about the height of eight or ten feet. They were almost uniform in height of trunk, diameter of trunk, and shape of crown. The growth was quite exceptional.

[1] Journal of The New York Botanical Garden **22**: 200. 1922.
[2] Journal of The New York Botanical Garden **21**: 85. 1920.

For the distance of twenty miles south of Palm Peach we made further studies on the coastal dune plant-associations. The prominent herbaceous plant-covering then was the beach sunflower (*Helianthus debilis*); at other times it is the blue beach-verbena (*Verbena maritima*). At the tide-limit comparatively few kinds of plants may be found at any time. The principal kinds are the sea-oats (*Uniola paniculata*)—a tall coarse grass, the beach-ragweed (*Artemisia hispida*) and the highwater-shrub (*Iva imbricata*), and particularly prominent are two succulent-woody plants, the one, *Scaevola Plumieri*, a relative of the lobelias, a bright green shrub growing in irregular clumps, with broad glossy leaves and black plum-like fruits; the other, *Tournefortia gnaphaloides*, a hoary bush, dome-shaped or in fantastic forms with copious narrow whitish leaves and clusters of heliotrope-like flowers. It is a relative of the heliotropes.

However, the great sand rollers or ground-swells, so to speak, of the coastal dunes are mostly covered with decidedly woody, wind-worn, stunted plants of various shades of green. The constituents of this woody plant covering fall, rather naturally, into two groups, which may be designated major and minor: under the former the sea-grape (*Coccolobis uvifera*), the cabbage-tree (*Sabal Palmetto*), the saw-palmetto (*Serenoa repens*), the cocoa-plum (*Chrysobalanus Icaco*), and the poison-wood (*Metopium Metopium*) stand out as the more prominent species. The elements of the minor division are naturally more numerous, and the following may be mentioned; the century-plants (*Agave decipiens, A. neglecta*), strangling-fig (*Ficus aurea*), Spanish-bayonet (*Yucca aloifolia*), Bahaman potato-bush (*Solanum bahamense*), lantana (*Lantana ovatifolia*), ernodea (*Ernodea littoralis*), black-torch (*Erithalis fruticosa*), snow-berry (*Chiococca racemosa*), marlberry (*Icacorea paniculata*), and myrsine (*Rapanea guianensis*).

In passing it may be of interest to mention that in the dune hammocks at the northern end of the eastern coast line the major elements are the red-cedar (*Sabina silicicola*), the cassena (*Ilex vomitoria*), oaks (*Quercus*, several species), American-olive (*Osmanthus americana*), xolisma (*Xolisma ferruginea*), spice-tree (*Anamomis Simpsonii*). The minor elements are French-mulberry (*Callicarpa americana*), gale-berry (*Ilex glabra*), and horse-sugar (*Symplocos tinctoria*). Thus we may notice quite

a different assemblage of plants on the coastal dunes, north and south. As may be seen on a preceding page, the northern and southern elements meet and mingle in the coastal hammocks about Mosquito Inlet.

Up the Eastern Coast

By the time we returned from the central part of the peninsula the period alloted for fieldwork was nearly spent. With so much already planned and so little accomplished, comparatively speaking, it was difficult to decide how to spend the remaining few days at our disposal. However, a panoramic view of the flora of the entire eastern coast was decided on. Consequently, one forenoon found us in the Cape Sable region, over the Dade-Monroe County line, and near the coast.

The surface of the land there, or the accumulated sand, marl, or humus, is supported on the Lossman's River limestone—a somewhat cherty white solid or porous stone. West of Cuthbert Lake[1] and West Lake[2] conditions of geologic and botanic interest have lately been disclosed through the digging of a canal and building of a highway to connect Cape Sable with the lower eastern coast region. The land is low. None of it is above the influence of the tides of the Bay of Florida. There are swampy hammocks and marshes. The hammocks occur for the most part where the rock is near the surface and covered with a thin layer of humus and other debris. In the lower spots, the marshes, the limestone is much deeper and it is buried beneath a thick formation of peat. Here instead of a hammock covering, we find a dense growth of saw-grass (*Mariscus jamaicensis*), cat-tail (*Typha angustifolia*), or rush (*Juncus Roemerianus*). Now, when this part of the State was higher, or, perhaps, even a little lower, in past geologic times, the present hammock portions were the islands, while the present marshes were channels, bays, and lagoons. A slight change in the elevation of the land surface or other causes may have cut off the action of the tides, after which these lagoons rapidly filled with humus and other debris. The present nearby lake or lagoons and channels owe their existence to the fact that the tidal action is still effective enough

[1] Journal of The New York Botanical Garden **17**: 189-202. 1916. Cape Sable region of Florida 1–27. 1919.

[2] Journal of the New York Botanical Garden **22**: 204. 1921.

to prevent their being filled rapidly with solid matter. The major climax vegetation of the marshes comprises the three plants mentioned above. Of course, other elements are present, all of which we hope to study in a season other than winter. Naturally, the process of turning channels and lagoons into land is very gradual as is, in fact, the whole process of nature in such a region. The development of the hammocks and the growth of the individual shrubs and trees, moreover, appears to be slow, as is evidenced by the prolific development of the epiphytic lichen flora, which appears to be extensive as well as copious. Clinging and hanging kinds of lichens are conspicuous everywhere in the hammocks.

Life on the ground in the hammocks has been and is precarious, except for amphibious woody plants, vines, shrubs, and trees, of all sizes and shapes. The herbaceous plants that have been able to stand the strenuous conditions there have mostly taken to the trees and pass an arboreal instead of a terrestrial existence.

The one noteworthy terrestrial plant found there was the wild-pepper plant, *Peperomia humilis*, our closest relative and quite similar in habit to the one we found at the mouth of the St. John's River and referred to on a preceding page. This plant was at the height of its aërial development and it was copiously flowered and fruited. The tiny fruits are wonderfully sticky and it was not until several hours after we collected specimens that our hands, faces, and clothes were free of the adhesive particles.

(*To be concluded*)

A RARE PLANT RE-DISCOVERED

More than seventy years ago the distinguished scientist-explorer Richard Spruce discovered a new kind of tree in the dense forests along the Rio Negro, near the boundary between Brazil and Venezuela. While it was obvious that his tree represented a species completely unknown to science, botanists were unable to decide what were the general relationships of the plant. It was consequently left without a name for some twenty-five years, when the eminent English botanist George Bentham christened it *Lissocarpa*, giving it a generic name only. Fifteen years more elapsed before a German botanist, probably without

seeing the plant, added a specific name and called it *Lissocarpa Benthami*. During this whole period, from its original discovery down to the present, the species has been known only from the original specimens collected and preserved by Spruce. His material is probably in poor condition, for the structure of the flowers is still uncertain.

During a recent collecting trip to British Guiana, a small tree with beautiful conspicuous white flowers was found growing along the Essequibo River, some 600 miles east of Spruce's locality. It was about twenty feet high and full of bloom, the twigs bearing hundreds of flowers, while the ground beneath was carpeted with the fallen corollas. Several specimens were prepared and study of them at the Garden showed that they were Spruce's long-lost *Lissocarpa Benthami*. Still other specimens were collected in 1922 along the upper Mazaruni River in northwestern British Guiana by our Indian collector, J. S. de la Cruz.

While *Lissocarpa* must be a very rare plant to have escaped the attention of collectors for practically 70 years, these recent discoveries so far from its original station lead us to suspect that it probably grows throughout the whole intervening region, which is very poorly known botanically.

H. A. GLEASON.

EXPERIMENTS WITH CHINESE CABBAGE

A conspicuous feature of the plants at the propagating house at this season of year is a collection of some six hundred plants of Chinese cabbage, many of them with all or part of their flower-clusters covered by paper bags. They represent a part of the experimental work on plant breeding carried on by Dr. A. B. Stout.

Studies of Chinese cabbage have been in progress at the Garden for several years. For this work, the plants are not encouraged to "head up," but are allowed to bloom. They send up tall stalks bearing many small yellow flowers of the form typical of the mustard family, to which they belong. Before the flowers open, transparent paper bags are tied over the stalks, in order to prevent any promiscuous pollination of the flowers. This process is effected by hand, removing only one or two bags at a

time, and applying the pollen from some one chosen flower. After pollination the bags are replaced until the flowering season is over, when the character of the pods and the nature of the seed formation can be observed and studied. Since it is definitely known just what pollen each flower received, various effects of heredity can be determined. The particular study in progress this winter is on the effect of cultural conditions upon the ability of these plants to form seeds.

Although the plant is called Chinese cabbage, it is really more closely related to the turnip, and this relationship is indicated by the delicate turnip-like flavor of the leaves. When properly headed, Chinese cabbage makes an excellent salad plant, bearing a large long head of very crisp tender leaves. In this form it is often seen in the markets and is becoming increasingly popular for home gardens. It must be grown in the cool part of the season, either in spring or fall, and be carefully protected against a number of insect enemies, including the common cabbage worm. Poorly cared-for plants show an interesting association of insects, some of them definitely injurious while others are beneficial in that they prey upon the harmful ones.

HESTER M. RUSK.

CONFERENCE NOTES FOR DECEMBER

The December conference was held on Wednesday, December 6, with the following program:

"The Fossil Flora of Alaska."—Dr. Arthur Hollick.

"The Taccaceae."—Mr. K. R. Boynton.

Dr. Hollick stated that the known fossil flora of Alaska was but 91 species until 1902. Since that time recent collections, many by Dr. Hollick himself, have increased this number to over 500. The Cretaceous flora alone is represented by 227 species, and of some 300 Tertiary species, about 150 will be described as new. An analysis of these floras reveals many interesting and several unique features. They show a mixture of semi-tropical and temperate zone elements that are nowhere known in our existing flora and associations of species and genera such as have not been found elsewhere in rocks of equivalent geologic age. Cycads of Jurassic type are found associated with undoubted Cretaceous angiosperms, and other cycads of more modern type are found associated with tertiary angiosperms (*Alnus*, *Corylus*, *Betula*, *Salix*, *Populus*, *Quercus*, *Hicoria*, etc.). No such association has ever been found among equivalent fossil floras elsewhere in America. Cycads had apparently been exterminated in the interior of the North American continent prior to the beginning of Tertiary time, but continued to survive on the Pacific coast of Alaska, indicating that at that time, as at the present, the climatic conditions there were milder than in the same latitude in the interior and on the Atlantic Coast. The presence of well defined specimens of fan palms also proves that a mild, semi-tropical climate must have prevailed there at least until the early part of the Tertiary Period.

The family Taccaceae, which includes two genera of tropical herbs, is now placed between the Amaryllis and Yam families. The genus *Tacca* has about 10 species, most abundant in the Malay Archipelago and the South Sea Islands, but also found in India, Australia, Africa, and South America, where *T. Parkeri* has been collected by Dr. Gleason and his assistants in British Guiana. *Schizocapsa*, the only other genus of the family, with one species, *S. plantaginea*, is found in China. It differs from *Tacca* mainly in its dehiscent capsule.

NOTES, NEWS AND COMMENT

About 300 biology students from Evander Childs High School visited the Garden on Tuesday morning, January 23, and were conducted through conservatory range 1 where they had instruction from members of the Garden staff in the principal types of plants exhibited there. On coming out of the conservatory and on the way to the museum building the nearby collections of conifers and deciduous trees were studied, attention being directed to their characteristic winter condition by which they may be identified. At the museum they inspected the economic collections on the first floor and convened in the lecture room where an illustrated talk on "The American Forests" was given by Mr. Hastings.

Dr. and Mrs. Britton and Dr. Seaver sailed for Porto Rico on Saturday, January 20. Dr. Britton will continue his studies of the flora of the island, and Dr. Seaver will pursue studies of fungi, in connection with Dr. Chardon of the Insular Experiment Station.

Dr. Small returned from Florida January 10, after a very successful botanical expedition, bringing back to the Garden many valuable accessions.

The January conference of the scientific staff and registered students of the Garden was held Wednesday, January 3. The program consisted of reports of the Boston meeting of the American Association for the Advancement of Science by Dr. Mel T. Cook and Dr. R. A. Harper.

Meteorology for December: The total precipitation for the month was 2.94 inches, of which 0.375 inches (3.75 inches by snow measurement) fell as snow. The maximum temperatures recorded for each week were: *56° on the 1st*, 54° on the 4th, 43° on the 12th, 43° on the 24th and 47° on the 26th. The minimum temperatures were: 16° on the 11th, 19° on the 13th, *14° on the 20th* and *14° on the 30th.*

Meteorology for the year 1922: The total precipitation for the year at the New York Botanical Garden was 45.48 inches. This was distributed by months as follows: January, 1.75 inches (including 7 inches snow measurement); February 2.41 inches

(including 8 inches snow measurement); March, 4.85 inches (including 3.50 inches snow measurement); April, 2.54 inches: May, 5.54 inches; June, 8.43 inches; July 7.09 inches; August, 2.20 inches; September, 4.89 inches; October 1.76 inches; November, 1.08 inches (including ½ inch snow measurement); December, 2.94 inches (including 3.75 inches snow measurement). The total snowfall for the year was 22.75 inches. The maximum temperature for the year was 97° on the 16th of August; the minimum was —2° on the 17th of February. The first killing frost of the autumn was on the morning of the 21st of October, when a temperature of 28° was reached. The latest freezing temperature of the spring was on the 29th of April, when 32° was recorded.

Among the visitors to the Garden who enrolled in the library during the autumn were the following botanists: Dr. Mel. T. Cook, New Brunswick, N. J., Dr. Cecil Yampolsky, Grantwood, N. J., Mrs. Flora W. Patterson and Mr. W. W. Eggleston, Washington, D. C., Prof. L. H. Bailey and Mr. W. H. Burkholder, Ithaca, N. Y., Mr. Frank W. Johnson, Buffalo, N. Y., Mr. Harold W. Pretz, Allentown, Pa., Mr. John M. Fogg, Philadelphia, Pa., Mr. Robert Pyle, West Grove, Pa., Mr. O. W. Barrett, North Clarendon, Vt., Prof. G. R. Bisby, Winnipeg, Can., Mr. C. Boyle, Royal College of Science, Dublin, Ire., Dr. Mario Calvino and Dr. Eva Mameli de Calvino, Santiago de las Vegas, Cuba, Dr. Carl Skottsberg, Gothenburg, Sweden, and Dr. Seiya Ito, Sapporo, Japan.

In the Philippine Journal of Science, 21: 131–148, August, 1922, H. Sydow enumerates the fungi collected by the late Dr. C. B. Robinson on the Dutch East Indian Island Amboina, where he lost his life. The collection contains three genera and twenty-three species new to Science. Other parts of Dr. Robinson's collections on this ill-fated trip have been studied and enumerated by other authors, and the results constitute a very important contribution to knowledge. It will be recalled that prior to his service with the Philippine Islands Bureau of Science, Dr. Robinson was an Assistant Curator at the Garden, and is commemorated here by the Charles Budd Robinson Fund.

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Vol. XXIV March, 1923 No. 279

JOURNAL

OF

The New York Botanical Garden

EDITOR

H. A. GLEASON

Assistant Director

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

VOL. XXIV March, 1923 No. 279

A TRIP TO PICO TURQUINO

For a number of years, I have been wishing to visit Pico Turquino, the highest mountain of Cuba, a collection of plants from that little known region being much desired at the New York Botanical Garden. I was waiting for some favorable circumstance, when, last June, came the notice that an expedition to that mountain was planned by Mr. Stephen Bruner, Chief of the Department of Plant Pathology at Santiago de las Vegas Agronomic Station, and Mr. Charles Ballou of the Bureau of Plant Sanitation. I judged it convenient to take advantage of that unexpected opportunity and joined the party with the agreement of the organizers. They had secured the cooperation of Dr. Erik Ekman, the Swedish botanist, who, seven years ago, ascended the mountain from the north, and they decided to follow the same way, which afforded the opportunity of collecting in a more extensive region. Besides the entomological work which was their chief purpose, they obtained from "Observatorio Nacional" several instruments to make meteorological observations and also to settle the height of the chief peaks, especially that of Pico Turquino.

We left Havana on July 3rd and after twenty six hours in the train we stopped at Yara, a small station between Bayamo and Manzanillo, famous for being the place where the first war began for independence, in 1868. There we were hospitably attended by the Mayor, Sr. Camacho, and especially by the Judge, Sr. Rogelio Matos. The day after, Dr. Ekman arrived, and after buying food supplies and some implements, we started, on July 6 in the morning, for Nagua, a small village 13 miles southward, among the first foothills of Sierra Maestra. We

all went on foot, for the purpose of collection in the savannas and low wooded hills along the way. When we reached Sabana del Cerro, we were much surprised to note the presence of elements of Pinar del Rio savannas, such as *Paspalum Neesii*, *Sporobolus cubensis*, and also *Byrsonima verbascifolia* of Isle of Pines, together with many hybrids of this species with *B. crassifolia*. Finally, we reached Nagua late in the afternoon, receiving cordial hospitality at the home of D. Joaquin Rio, as soon as we let him know our purpose.

The day after we thought it worth while to go back to Sabana del Cerro and explore more thoroughly that interesting locality. A small *Ophioglossum* unknown to us, found near Cerro Pelado, and a tree, *Cordia* sp. probably new to science, from Zabala hill were the chief rare things encountered. A storm of unusual violence made our return somewhat difficult, several rivulets being suddenly changed into swift rivers.

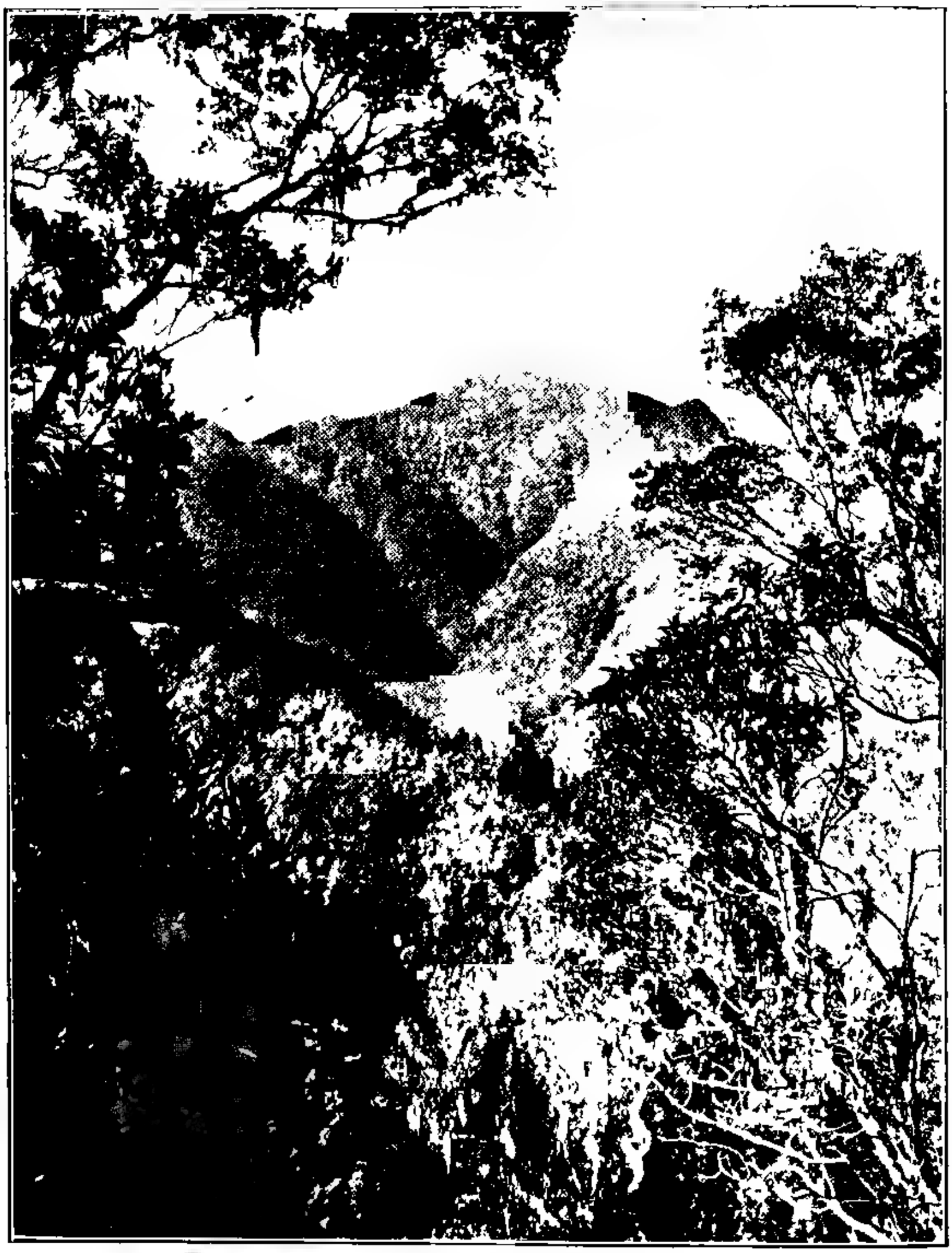
On July 8th all the party crossed Yara river, near our headquarters in Guayabal de Nagua, in order to visit the low Mucaral and Quintin hills. An interesting *Machaonia* was found, and some other rare species, as for instance a *Dorstenia* unknown to us, *Triscenia ovina*, and others. Behind our home, we found also large clumps of *Tripsacum dactyloides*, a genus of the grass family not yet detected in Cuba, and at the same place the rare *Psychotria auriculata* collected only once, by Charles Wright.

In the meantime, everything was prepared for a stay of about three weeks in the mountains, far from any habitation, and four "practicos" were secured, two to stay with us, by turn, and two to carry down to Nagua the plants collected, and return with food supplies. It was judged impracticable to take driers with us, all our route being in woods with no open places. The carrying would also have been very expensive, so, it was decided to leave the care of drying specimens to our host, D. Joaquin Rio, who accepted very willingly and helped by his sons did his best, to our complete satisfaction. If the specimens are not all in very good condition, that is due to the fact that sometimes they remained necessarily four, five or even seven days without being put in the press and sometimes were injured by rain.

On July 10 we started from Guayabal de Nagua, and to avoid Yara river below its chief tributary, the Nagua, swollen

by the recent rains, we went through Arroyo and Sabana del Corojo, the Colonia woods and Sabana del Peladero. The flora is not of great interest but the landscape was becoming beautiful when we reached the narrow upper valley of the Yara. Everything was carried by men, the guides with a full cargo and the explorers with a load sufficient to make collecting a hard task. If we had taken beasts of burden, the way would have been soon impracticable, as for instance at Casa de Piedra, on the shore of the river where the path is on a border of a high cliff and is hardly wide enough for a single man. After crossing many times the river and its tributaries: rio Providencia and arroyos del Salto, del Cristo, del Angel, del Corazón y del Brazón, a walk of about nine miles, we reached the mouth of Arroyo de León, where a rude shelter of palm leaves permitted us to spend the night without pitching the tent. There we had the pleasure of detecting on the banks of the river a large "cola de caballo," likely *Equisetum ramosissimum* Desf., about three meters tall, and a number of other specimens, among them a big *Plumiera* about ten meters tall, which we cut down with our crosscut-saw. We collected on the banks of the river until night. Several species of insects new to science, were also discovered there by Mr. Bruner and Mr. Ballou. Then we ate our dinner, unexpectedly improved by our guides with two kinds of honey, the one of the common bee, and the other of the stingless Cuban bee, "abeja criolla" (*Mellipona fulvipes*), whose cells have the size and shape of an egg or little less, with a honey better than the common one.

July 11. We prosecuted our march along Yara river, leaving on our right the arroyos de Domingo and del Naranjo. The barometer showed an altitude of 280 meters. Then we began the steepest of the four chief ascents of the trip: the Loma del Naranjo followed immediately by Loma del Sabicu, and at an altitude of nearly 1000 m. On the crest of the Maestra, we set up our tent. No more clear water was available to prepare our meals so we had to find it in the "curujeyes" (bromeliads growing on the trees). This water is blackish and has not a very good taste, but it is rather cool, and usually in sufficient amount for drinking and for cooking. These bromeliads are, of course, the breeding place of many mosquitoes. Two kinds of horse-flies are also common there, one of which—the "fofofa"



Pico Turquino seen from Maestra ridge at 1300–1400 m.

—is very abundant and much more troublesome than mosquitoes. Some of our guides, apparently convinced of the theory of spontaneous generation, think that it is produced by a tree, common there, the "ramon de vaca" (*Dendropanax arboreum*). We noted a great variety of trees, especially Melastomaceae, Myrtaceae; Lauraceae and Rubiaceae, and a great display of ferns of all kinds. The "manaca" palm (*Calyptrogyne occidentalis*) is abundant, and an interesting grass, *Senites Zeugites*, not yet recorded from Cuba, is common up to the summit of Turquino. It was found formerly by Doctor Ekman. When talking at night, we saw on the roots of a tree a curious phosphorescence, produced likely by the mycelium of some fungus. They say that this is causing "mazamorra," a swelling of the legs in men and animals with an unpleasant irritation. In fact, some days after, several of us had the feet and legs swollen. If that has no relation to the phosphorescence, as we may suppose, the many scratches and wounds collected along the way were sufficient to produce it, for we were walking with "alpargatas," or slippers made of hemp, preferable to shoes for jumping over the boulders of Yara river or for crossing the rocky peaks of the Maestra, but not so good to walk among the pointed stems of the shrubs cut down to make the way.

July 12. We left Sabicu Camp and proceded to the southeast, along the crest of the main ridge. None of the "practicos" had yet gone to Pico Turquino, and from that place up to the summit, the only true guide was Dr. Ekman. Botanically, the peaks of that crest are interesting, and on one of them we collected a number of rare species such as *Solonia reflexa*, a genus of the myrsine family discovered by Dr. Ekman a few years ago, a splendid *Euphorbia* with fine red bracts, and a velutinous leaved species of *Vitis*, apparently distinct from the common *Vitis caribaea*, but unluckily barren. In the meantime our fellow entomologists were collecting more new species of bugs. At lunch our "practicos" brought us again some honey, apparently of *Weinmannia*, and sweeter than the preceding; they easily located a colony of bees by observing the direction of their flight. The hill where we ate our lunch is at about 1200 meters whence we turned westward, crossing a region where there are small clusters of pine with a characteristic white flowered *Coccocypselum* on the ground, alternating with "fan-

gales," a wet ground flora, characterized by a large amount of *Elaphoglossum*, *Asplenium* and *Dicranopteris*. We stopped at night not very far from the base of Loma de Palma Mocha, at 1100 meters altitude.

July 13. Leaving the impedimenta under the tent, we tried to find our way, but progress onward was becoming difficult; the many windfalls due likely to the cyclone of 1915, and the consequent growth of tree ferns and *Odontosoria*, all spiny, made it difficult to find the old way, opened seven years ago by Dr. Ekman and followed two years later by Dr. Beck, in search of birds. On that same day, it began to rain at about 8 A. M. and everybody came back thoroughly wet and Dr. Ekman had his hand cut with so many spines that he could not use the "machete" for several days.

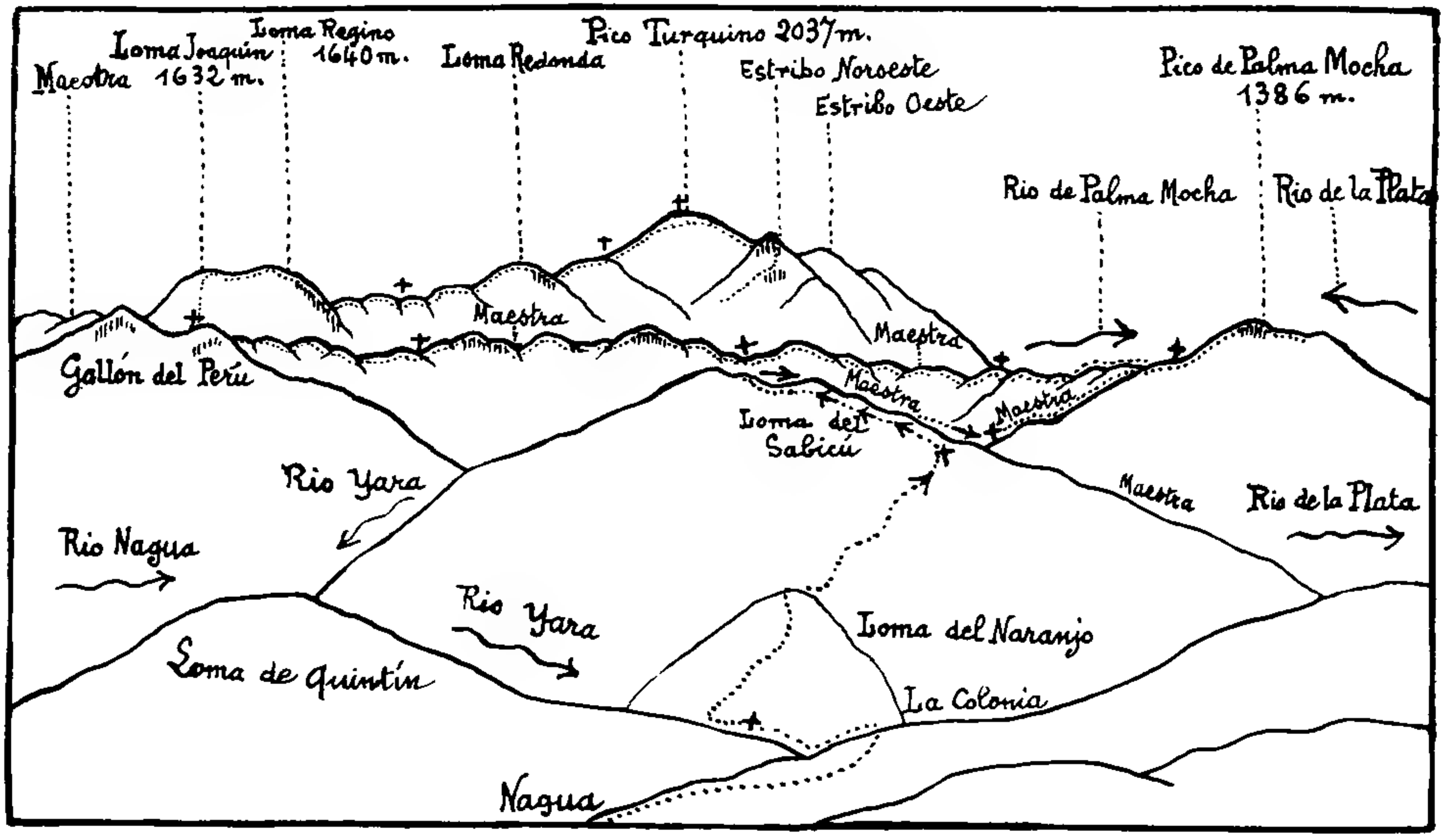
July 14. The way was finally opened farther than Palma Mocha Mountain. Fungi, lichens and ferns abound in the fangales nearby and some interesting specimens were collected such as a white flowered *Clethra*, perhaps distinct from *Clethra cubensis*. The night was cool, the minimum temperature being 60°.

July 15. We left Fangales Camp and began the ascent of the second steep slope, that of Loma de Palma Mocha. We established the new camp at the base of the peak (1262 m.), slightly eastward of our course. All the time after our lunch was dedicated to collecting on Palma Mocha peak (1386 m.) and I was not a little surprised to find under a rock, a can containing a postal card with a view of Colegio de la Salle, saying that Dr. Ekman, Regino Verdecia, and Joaquin Rodriguez slept near that rock the night of Tuesday after Easter of 1915. From a rock at the summit, we had a wonderful view of the imposing Mount Turquino, some miles in front and separated from us by Palma Mocha river. At about 3 or 4 o'clock the clouds disappeared and Mr. Ballou took some good photographs of the mountain. Several orchids and a number of mosses were collected. *Hypericum fasciculatum*, three meters tall, and a species of *Viburnum*, a genus new to Cuba, were rather abundant, and we also collected *Clusia tetrastigma*, *Vernonia purpurata*, and several species of the melastoma family.

July 16. After leaving Palma Mocha Camp, we turned to the southeast, following as before the main ridge of Sierra

Maestra, between the basin of Palma Mocha river on the right and that of Yara river on our left. We were in a forest where large timber was not rare and the most common plants encountered on this crest were *Palicourea alpina*, *Dendropanax arboreum*, *Graffenrieda chrysandra*, *Ocotea leucoxylon*, *Viburnum* sp., *Cyrilla racemiflora*, *Brunellia comocladifolia* and many melastomads. After walking one or two miles, we were not far from a small stream beginning on the eastern slope of Loma de Palma Mocha, likely one of the headwaters of Yara river. We cleared up the place, so well fitted for camping, being the only one from Yara river to Pico Turquino with clear water practically available. The slope is steep, and sometimes the practicos upset the pail of water repeatedly before getting it safely to the camp. Nevertheless we took advantage of the relatively short distance of the arroyo to do some good collecting on its banks, finding mostly ferns, several of which were not seen heretofore. *Callicarpa apiculata* of the vervain family and a sedge of the genus *Uncinia*, yet unrecorded from Cuba, were also found. Having covered the ground under the tent with a layer of tree fern leaves and another of *Lycopodium cernuum*, we could sleep pretty well, nearly as well as in our hammoncks which we had left in Nagua to reduce the load.

July 17. From Arroyo Camp we went to Laguna Camp, which name does not mean a lagoon as usual, but a small pool, or a series of "babineyes." A babiney is an excavation in the ground, usually made by wild hogs and retaining rainwater which is not attractive at all, with its yellow color, but is rather cool and has no bad taste. The tent was then pitched near one of these babineyes so we might have a sufficient supply of water. We noted along the way the presence of an *Elaeodendron* with fruit ovate to oblong and *Mettenia globosa*. We observed also for the first time that *Mecranium amygdalinum* of the melastoma family is a hardwood tree. Some of the high trees, for instance *Alchornea latifolia*, are identified by means of the "tirador," or thrower invented by Dr. Ekman. It is a cylindrical piece of lead at the end of a long rope which, when skillfully thrown over the branches, enables one to obtain a sufficient specimen to know the species without sawing down the tree. On this ridge grows the flora of "monte frio" interrupted from time to time by some "fangal" with its many *Elaphoglossum*



Bird's-eye view of the Pico Turquino region, trail followed, and camps.

and tree ferns and where one sinks sometimes one or two feet deep in the wet layer of dead leaves.

Many "torcazas" (ringdoves) were crossing the gap where our camp was located. One was killed to improve our menu, but the forest is too dense to be a good hunting place. There, we saw also the "Torcaza aliblanca" or white wing dove and did not fail to hear from time to time the sweet song of the Cuban nightingale (*Myiadestes Elisabeth*). The most common among the other birds seen are: the "zorzal real" (*Mimocichla rubripes*) the "zunzún" (*Ricordia Ricordii*) and the "tocororo" (*Priotelus temnurus*), one of the finest Cuban birds.

July 18. Before leaving Laguna Camp, photographs were taken of a huge "marañon de la Maestra" (*Magnolia cubensis*) and also of Pico Turquino and Gallón del Perú, to the North,—a mountain about 1100 to 1200 m. high, and just the opposite side of Pico Turquino. We then ascended a series of peaks of all sizes, about forty having to be crossed from Yara river to the summit of Turquino. The ridge was becoming very narrow and rocky and was covered with a lower vegetation than before seen. The peaks are capped with big stones where these peculiar plants were detected:—a small leaved *Begonia*, a *Xolisma* sp., a *Vaccinium*, and more interesting yet, a "sabina," (*Juniperus* sp.) of only one kind of leaves and distinct from *Juniperus virginiana*, the only known species of Cuba. We were compelled to camp on that crest, where there was just a sufficient space to pitch the tent. Daylight had passed but before taking our meal, we had much to do while the guides cut trunks of trees to make a fire. Mr. Ballou prepared the tent by the light of a candle and the others went in the dark with an oil-cloth and a pot in search of water. Dr. Ekman succeeded in coming back with the pot full of water in one hand, among inclined rocks where only a few small trees can prevent us from slipping down. Everything was wet after the rain of the afternoon, and we talked late around the fire, fearing not to be able to sleep that night. It was, in fact, somewhat cold, about 56° F.

July 19. We left Sabina Camp early and after crossing a few more peaks, we reached the foot of Loma Joaquin where there is a babiney and where we spent the next night. In the vicinity we saw many mosses, and among ferns we noted fine plants of *Marattia* sp. It was desirable to reach some stream

for collecting but they were too far down, and "parrilla" (*Arthrostylidium multispicatum*) made it impracticable. On that day we found along the way *Ditta myricoides* which we collected successively with staminate and pistillate flowers and fruits in case that the position of this species be doubtful. *Scolosanthus densiflorus* was also common and we collected a small barren tree, apparently of the myrtle family, with small narrow coriaceous leaves which looked to be an interesting novelty Late in the afternoon we heard the two guides who had been sent to Nagua hailing us. They were bringing food supplies and good news about the drying of specimens.

July 20. We now left the dividing line or main ridge of Sierra Maestra to begin the third great ascent, that of Loma Joaquin and Regino, two peaks separated only by a small depression and forming a single mass. It was the beginning of Estribo Turquino, nearly at right angles with the main ridge and much higher. Here, we had to ascend from 1354 m. to 1640 m. When reaching the summit, I had the pleasure of seeing for the first time a field of *Sphagnum* and a Lauraceous plant unknown to us was also collected and we proceeded among a great variety of mosses and other cryptogams to Loma Regino and then down a very steep and long descent. There we saw a rare *Cestrum* sp. among some other interesting things not seen heretofore. Down in the gap near Regino cliffs was a fine species of *Duranta*, apparently undescribed, with showy lilac flowers, a blackberry (*Rubus alpinus*) and two species of *Begonia*. A floral feature was *Hacnianthus salicifolius* with masses of white fragrant flowers. After crossing a few peaks more, we pitched the tent, hoping the next day to get up not very far from the last summit. We had a fine view to the east of Bayamesa Mount, a little lower than Pico Turquino, and already had a look at the southern seashore near the mouth of Rio Turquino. During the night, the thermometer reached 54° F.

July 21. After leaving Estribo Camp, we crossed Loma Redonda, the last top before reaching Turquino. There a *Carex* sp. was collected on a wet rock among mosses and hepatics, and Dr. Ekman rediscovered the very rare and curious *Dendrophthora epiviscum*, which is a loranth growing on another loranth. We then began the last ascent, stopping at night. No place was available to pitch our tent but everybody managed

to find a sleeping place where there were not too many stones or roots. Our meal was more than frugal, we did not make a fire, having no "curujeyes" to supply water, but on pressing the mosses and hepatics growing on the rocks we could get a small amount for the more thirsty of our number.

July 22. Early in the morning we resumed the climbing. It was not very steep, and before seven A. M. we had the pleasure to stop on a fine open place with splendid sunlight and a spring temperature. The top is nearly flat with an extension of about an acre and a rather dense growth of shrubs and small trees up to eight meters high. A transverse band North-South about twelve meters wide and fifty meters long is covered only by rather low shrubs and appears as if it had been cleared from trees by a preceding expedition—perhaps that of the Cardero Brothers in 1918. In the central portion were two boulders with a bottle carefully sealed with beeswax and containing a paper wrapped in lead foil of a kodak film and signed by Mr. G. C. Bucher. We read that on April 10th, 1922, they reached that place. The five gallon gasoline tin which they had brought was there with a good amount of rain water, much appreciated by all the party. The rest of that day, we studied the vegetation of the peak and of its immediate southern slope, noting that the phanerogamic vegetation is not so varied as at lower altitudes, and seems not to exceed eighty species. Only two tree ferns were observed,—a species of *Cyathea* and an *Alsophila*. We saw three or four lycopods, a number of species of *Hymenophyllum*, *Trichomanes Elaphoglossum*, and many mosses. The most common phanerogams on the very top are: *Garrya Fadyenii*, *Palicourea alpina*, *Viburnum villosum*, *Lobelia* sp., *Hedyosmum* sp. *Mikania Swartziana*, *Cestrum* sp., several species of *Ilex*, *Senites Zeugites*, *Haenianthus salicifolius*, *Myrica* sp., *Miconia Grisebachii*, *Henriettella Ekmannii*, *Peratanthe Ekmannii*, *Begonia* sp. *Brunellia comocladifolia*, *Rapanea ferruginea*, *Ditta myricoides*, *Epidendrum teretifolium*, *Cyrilla racemiflora*, *Rubus alpinus*, *Peperomia tenella*, and several bromeliads.

July 23. We decided to explore the northwestern spur, where some days before we had observed from a distance the highest pine grove of the Island and an open place looking like a savanna. On our way, very near the top, we saw several places dug out by wild hogs. The color of the soil is yellow or

slightly reddish, and looks as if it contained a good per cent of clay, which may also be said of the soil of the main ridge, down to Sabicu's crest, where babineyes which so well retain the rain water are not rare. A few things were collected on that excursion. The grove of *Pinus cubensis*, as usual in Sierra Maestra, had nothing very peculiar, and that which looked like a savanna was only a "helechal" or fern field—in the present case a dense growth of *Dicranopteris*, preventing nearly all other kinds of vegetation. A storm surprised most of the party at their return, but gave us a good supply of water which was much needed. The nights spent on the top were cold, a strong breeze blowing from the sea all the time. The temperatures maxima and minima observed by Mr. Ballou are as follows:

	Maxima	Minima
July 22	66° F.	52°, 7 F.
July 23	75°	53°, 4
July 24	64°	50°

With respect to the altitude, according to our barometers it is 2037 m. Dr. Ekman, seven years ago, with a good barometer, found 2040 m. These results nearly agree with the altitude given by the United States Hydrograph-Office, which is of about 2020 meters, (6560 feet). Several expeditions using the boiling point of water found altitudes ranging between 2300 and 2400 m. It would be interesting to know the cause of this constant discrepancy between the result given by good barometers and the boiling point of water.

July 24. At ten A. M. we began the descent, anxious about the specimens left at Estribo Camp, several days before, and possibly injured by rain. Mr. Bruner and Mr. Ballou remained on the top till next day to take photographs. We spent the night at Estribo Camp where we were sorry to see the big package of specimens left under a tree thrown down by wind and exposed to rain. We made an arrangement with the two practicos to go to Nagua in turn to carry the specimens by forced marches in two days. On that same day, very interesting species were collected, especially by Dr. Ekman, on the cliffs of Loma Regino. A zanthoxylum, very spiny, a shrubby species of *Salvia*, probably unknown, *Arenaria lanuginosa*, an addition to Cuban flora, a *Rhytidophyllum* sp. unknown to us, etc., were collected.

July 25. We left Estribo Camp early and were soon at the foot of the hardest of all the ascents of the trip, that of Loma Regino. In some places we climbed more with the help of our arms than with our legs; that did not prevent us from collecting some melastomads, such as *Miconia dodecandra*, and near the top, species of *Duranta*, apparently undescribed. The way being open, we returned much more speedily, and at night we were again at Arroyo Camp, after having collected specimens of a very interesting tree, a narrow leaved species of *Haemocharis* and specimens of a lauraceous plant remarkable for its fragrant wood.

July 26. Walking all day long, we reached Sabicu Camp; unluckily very little time was left to collect again on that rich ridge. The next day, before getting down to Yara river we cut down several interesting trees to obtain flowering specimens, among them the "hilacho," (*Chimarrhis cymosa*). Down Loma del Sabicú another tall tree drew our attention, with its many fallen flowers. It was the rare "tagua tagua" (*Maba caribaea*) of the ebony family. After two or three hours of descent, we were not far from Yara river. The air is perfumed with the fragrant odor of "nabaco," (*Faramea occidentalis*) and we heard the merry talk of our practicos who had killed two "jutias" (rodents of the genus *Capromys*) and a bird, difficult to identify, as it was ready for roasting. They had also a good amount of honey and mangos. All of which with our own supply helped to cover the ten or eleven miles remaining. We took our lunch at Casa de Piedra, a good place for bathing and shaving, and took a late meal. Soon after it began to rain heavily and we did not reach Nagua till late at night, after having crossed on that day Yara river 26 times, and its affluents 5 times.

The following days were devoted to the drying of specimens after which I started to Yara with Mr. Bruner and Mr. Ballou, stopping only to climb on top of Cerro Pelado. The next night I took the Havana train, taking with me the collection of about 630 field numbers.

Dr. Ekman remained in Nagua for some time to visit a few interesting places, among them San Juan de Buena Vista—one of Wright's localities— but he was much disappointed to find the place cultivated and grown over with guinea grass.

We are especially indebted for their many kindnesses and hospitality to Sr. and Señora D. Rogelio Matos, Judge of Yara, and also to Sr. and Señora D. Joaquin Rio of Nagua.

BROTHER LEÓN.

COLEGIO DE LA SALLE, VEDADO, HAVANA.

LAND OF THE QUESTION MARK

REPORT ON EXPLORATION IN FLORIDA IN DECEMBER, 1920

(Concluded from February number.)

The epiphytic flora, aside from the flowerless plants, consists, as would be expected, mainly of orchids and bromeliads. There are more than a dozen kinds of the former and nearly a dozen of the latter. One wild-pepper plant, our largest species, *Peperomia obtusifolia*, inhabits the trees.

The two large trees of the swamps were the buttonwood (*Conocarpus*) and the black-mangrove (*Avicennia*). They indicate great age and slow growth. These trees have great vitality. They have withstood the hurricanes of centuries, but their postures have been changed several times, for most of them have been blown over as a result of high winds and loose anchorage, and their main trunks and often the secondary trunks now lie prostrate on the hammock floor. Their tops are often intricately bound together by herbaceous and woody rampant vines. The largest herbaceous vine, a so-called rubber vine (*Rhabdadenia biflora*) showed much variation in its leaves. In the dense jungle the 'eaf-blades were broad-oval or elliptic, while in the open they were long and narrow. This vine blooms all the year round; but, although it was the beginning of winter, by the calendar, the advent of spring was at hand for much of the vegetation.

Among the woody plants, the buttonwood (*Conocarpus*), black-mangrove (*Avicennia*), devil's-claws (*Pisonia*), bojuco-prieto (*Hippocratea*), cocoa-plum (*Chrysobalanus*), and Virginia-creeper (*Parthenocissus*) were just beginning to expand their flower-buds. Besides the intimate association of such a temperate vine as the Virginia-creeper with the tropical devil's claws and bejuco-prieto, it was of interest to note the condition of the Virginia-creeper. In the winter season the plant exhibited

the highly colored leaves just as it does in the autumn at the North, and the bursting flower-buds, as it does in the late spring in higher latitudes.

Ferns, like orchids, were plentiful. About five genera were represented by epiphytes and two by terrestrials. The great leather-fern headed the list for size. Gigantic leaves in large clumps, about fifteen feet tall and two to three feet wide, were not uncommon.

The rock of the highway itself—well named in this instance, for every inch of the roadbed from the Biscayne Pineland to the Cape Sable region is higher than the surrounding country—supported the only exotic flora thereabouts. During the process of dredging the canal and building the embankment weeds were introduced—for example, beggar's-ticks (*Bidens leucantha*), worm-seed (*Chenopodium anthelminticum*), poke (*Phytolacca rigida*), red-clover (*Trifolium pratense*), dock (*Rumex crispus*), and cinquefoil (*Potentilla norvegica*) were flourishing and abundant. However, it is doubtful if they can compete with the conditions of their strange environment. The exotics similarly introduced along the highway on Royal Palm Hammock and mentioned in a former paper[1] have for the most part gradually succumbed and thus naturally eliminated themselves from the flora.

Before leaving this Jungle Without Peace[2]—either of mind or of body—it may be well to record that in addition to the epiphytic cactus (*Harrisia*) mentioned in a former paper,[3] two additional kinds, a prickly-pear (*Opuntia Dillenii*) and the dildoe (*Acanthocereus pentagonus*) were found growing on trees instead of on the ground. An interesting addition to the flora of the Florida mainland was the native wild cotton (*Gossypium hirsutum*), which is so common on many of the islands of the Florida reef.

A bird's-eye view of the vegetation from the Cape Sable region to Royal Palm Hammock would show on the Lossman's River limestone the small marshes and hammocks as just described, then more extensive marshes and lower and more

[1] Journal of The New York Botanical Garden **17**: 41. 1916.

[2] With apologies to Dr. William Beebe.

[3] Journal of The New York Botanical Garden **17**: 191. 1916, **22**: 205. 1921. The Cape Sable Region of Florida 10. 1919.

straggling hammock with clumps of the saw-cabbage palm (*Paurotis Wrightii*). The floristics of the Miami oolite would be prairie with scattered hammock islands or rarely a pine island.

The characteristic pure woody growth on the Lossman's River limestone region is the red-mangrove (*Rhizophora Mangle*), which exhibits beautifully how firmly habits of growth are fixed in plants. Now, this typically coastwise plant is present inland either as a remnant of a time when the land was less elevated and the present fresh or brackish marshes were salt-water lagoons, or the present growth is a result of seeds washed in during the high water caused by hurricanes coming from the south. At any rate, the plant is there, and although in a protected habitat where special anchorage to keep the individuals from being washed away is unnecessary, each little mangrove plant when only knee-high sends out just as many anchor-roots as like plants do in the soft maritime mud-flats.

The characteristic pure woody growth on the Miami oolite is the pond-cypress (*Taxodium ascendens*), which is often so thickly placed that in winter, when the foliage is wanting, the great areas of stunted trees give the effect of a gray haze over the prairie. This tree, too, shows the persistence of special characters in plants. Although there is no need of special bracing and anchors in the stiff, hard marl of the prairie, this tree, accustomed to growing in habitats with insecure footing develops just as large a buttressed trunk-base and subterranean anchor-roots as it does anywhere.

We left the Cape Sable region on the afternoon of December nineteenth for a survey of the whole eastern coast of the State. We stopped several hours in Miami during the evening for the purpose of packing, and then started northward again. Most of the observations made along the way are for discussion in future papers; but a few may be touched upon here.

In the "scrub" about half way up the coast we met with a shrub which had apparently reverted to its primitive habit of growth. The gopher-apple (*Geobalanas oblongifolius*), growing as it usually does in a continuously fire-ravished region, has assumed the habit of burying its main stem under the ground. From this subterranean stem it sends up branches usually from six to twelve inches high. These are often annually destroyed by fire, but the main stem is undamaged, and sends up new

branches after each fire.[1] No doubt far back when this plant first came into existence it was an ordinary shrub with a tap-root and an erect branched stem. At any rate, there we found it, not in its now normal condition, but like an ordinary branching shrub, up to five feet tall.

South of Melbourne a sand-dune, doubtless an active one in a former geologic age, particularly attracted our attention. There occurred the indigo-berry (*Randia aculeata*) at about the northern limit of its geographical range and the silver-buckthorn (*Bumelia tenax*) at about the southern extremity of its range. The naked-stopper (*Anamomis*), the first representative of the genus found west of the Gulf Stream, was equally common as an associated dwarf hickory (*Hicoria*), which belongs to a group of dune hickories which have not yet been studied. We also extended the recorded geographic range of the less widely distributed of our two native century plants (*Agave decipiens*) about one hundred miles northward.

Cool weather prevailed and blooming plants were in little evidence along the coast. However, here and there in the hammocks one saw spiderworts (*Tradescantia*), ironweeds (*Vernonia*), bonesets (*Eupatorium*), crown-beards (*Verbesina*), and asters, particularly the elegant Carolina aster in the low hammocks or on creek borders.

The Halifax River lagoons and shell-mounds seem to be the northern limit of the geographic range of several tropical shrubs. Among these may be mentioned snowberry (*Chiococca racemosa*), wild-coffee (*Psychotria undata*), spice-tree (*Anamomis Simpsonii*), red-pepper (*Capsicum baccatum*), marlberry (*Icacorea paniculata*), myrsine (*Rapanea guyanensis*), wild-lime (*Zanthoxylum Fagara*), and whitewood (*Schoepfia chrysophylloides*).

The following quoted lines from a letter written by William Baldwin[2] in 1817, is interesting, as it described his approach to

[1] Journal of The New York Botanical Garden 20: 204. 1919.

[2] William Baldwin (1779–1819), was born in Chester County, Pennsylvania. After taking a partial medical course at the University of Pennsylvania, he shipped as surgeon in a merchant vessel in 1805, for China. Returning the following year, he completed his medical course, and practiced for four years at Wilmington, Delaware. In 1812 he became surgeon in the United States navy and was stationed at St. Mary's, Georgia, and later at Savannah. From March to May 1817, he visited Florida, devoting most of his time to botanical exploration. Later in the same year he accompanied a

the great hammock of the present Ormond-Daytona region and his discovery of a "myrtus" which remained uncollected and unnamed for a century after Baldwin's visit to those parts.

"From this plantation [that of Mr. Hernandez, perhaps twenty miles north of the present Daytona, see quotation on a suc-ceeding page] we again took our land tacks on board, and reached this [Tomoko river] on the evening of the third day,—50 miles southerly of St. Augustine. The land, I find, increases in fertility as we advance south,—the Hammocks more rich and extensive,—and even the Pine land of a better quality. From this place we again took to the water, cruising down Tomoko, in the midst of shoals of alligators, for 3 or 4 miles in a N. easterly direction until we entered Halifax river (a lagoon, or arm of the sea,)—when we again bore up south, straight as a line could be drawn, 14 miles to the habitation of Mrs. Carr, a widow, on the western shore. Here was a noble spontaneous grove of Orange trees—principally the "bitter sweet" (Seville)—loaded with fruit in high perfection, and at the same time in flower. Here, also, I discovered a species of Myrtus, and a white Blackberry! Recollect, I am only telling you a part of the story. I have seen many other new plants, and fine things, too tedious to mention. . . . the following evening we landed safely at the Ruins of New Smyrna,—about 16 miles further south, and the same distance from any settlement. . . . A few miles further south, the river—heretofore wide, straight, and uninterrupted—begins to wind among numerous small Islands, covered with the ever verdant "Mangrove" (Rhizophora Mangle, L.). One of these small Islands has been selected (time immemorial,) and occupied by the large Grey Pelican. Thousands were here assembled, feeding their young. The nests, composed simply of "marsh grass" (Spartina glabra), covered the Mangrove trees as thick as apples. We landed among them: and such a screaming as they made, could hardly be exceeded by the Indians. I was surprised to find among them, great numbers of the "Forked

United States mission to various South American ports. Upon his return the following year, he lived at Wilmington, Delaware, until he was appointed surgeon and botanist to Long's expedition up the Missouri. His health, always delicate, broke down soon after the expedition was under way, and he died at Franklin, Missouri. Many of his letters were published in 1843, by his friend Darlington, under the title "Reliquiae Baldwinianae."—J. H. B.

tailed Hawk." These soon soared aloft, and disappeared. Here and there, also, was a hungry Buzzard, watching to catch the offal. Such a rendezvous of feathered gentry I have never seen,—unless it be the Cormorants, which roost by hundreds of thousands on a sand-spit, running off from the north end of Talbot Island: but there were Cormorants alone, and not Hawks, Crows, Buzzards, Cranes, Curlews, etc."

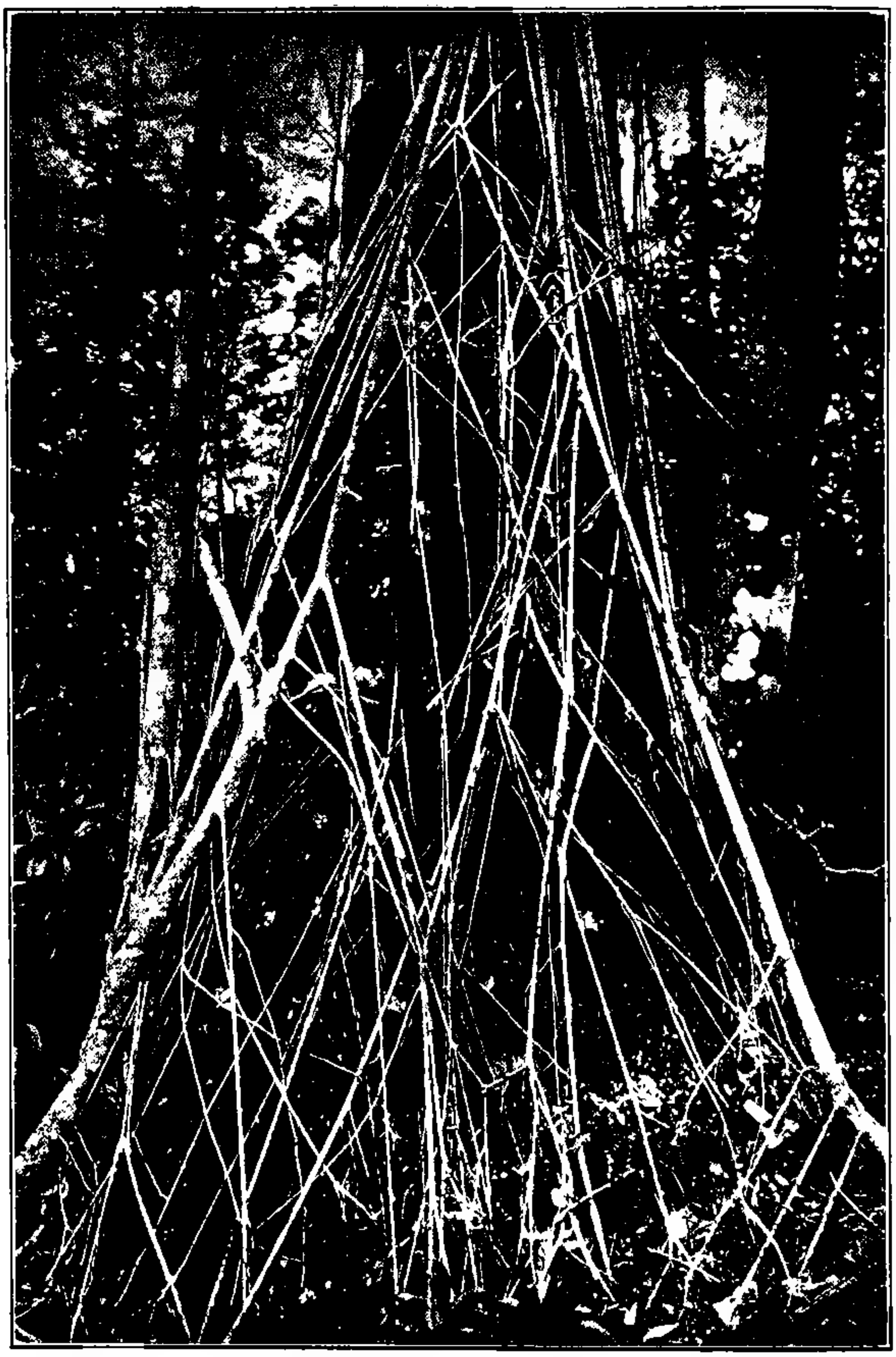
It should be noticed that all of the above-cited tropical shrubs and trees have fleshy fruits and are eaten by birds. It is more than probable that birds, especially migratory birds, feeding on the fruits of these kinds of tropical shrubs, planted them for ages gradually further and further north, and at present the species have adapted themselves to the more northern environment as far as the Halifax River.

North of Daytona the character of the coastwise hammock changes. Maples (*Acer*) and sweet-gum (*Liquidambar*) appear among the cabbage-trees (*Sabal Palmetto*), magnolias (*Magnolia foetida*), live-oaks (*Quercus virginiana*), red-bay (*Tamala Borbonia*) and holly (*Ilex opaca*). In the region of the mouth of the Tomoka River we traversed a plant association different from any we had previously encountered. It was a compromise between the ordinary high hammock one we expect to find in that part of the State and the "scrub.' *Garberia fruticosa* was there, the cabbage-trees were replaced by the saw-palmetto (*Serenoa repens*). The common spruce-pine of the typical "scrub" was replaced by another form of uncertain relationship.

We were then in the region where one of our problems might be solved. We were seeking the northern limit of the natural geographic distribution of the coontie (*Zamia umbrosa*). William Baldwin while descending the coastwise lagoons from St. Augustine a little over a century ago says:[1]

"The evening proving squally, we were unable to recross Matanza river; and took up our abode for the night, in the ancient and venerable fabric erected by the old Fish, who was the original proprietor of the island Anastasia. He was a native of Flatbush, in the State of New York; and made improvements which have hardly been exceeded in any part of the Province. Here are the remains of perhaps the most celebrated Orange Grove in the world. Some trees still remain that are 30 feet

[1] Reliquiae Baldwinianae 225. (1843).



In the Nixon-Lewis Hammock, Dade Co., Fla.—Strangling-fig (*Ficus aurea*) in the early stages of destroying a live-oak. Ultimately the rope-like strands will coalesce. After the oak has succumbed the tissues of the fig may fill the mould left by the decaying oak-trunk. The trunk of the fig thus formed may be strangled as was that of the oak. In fact examples showing where a fig has strangled itself three times in succession are not uncommon in the hammocks.

in height—and still retain a portion of their golden fruit. But all is now in ruins. Two generations have passed away. . . . Early in the evening we encamped on Penon (Rock Island), situated on the north shore of Matanza Inlet. This is a small barren Island; containing, however, a remarkable mound of oyster shells, full of bones of the aborigines, along with the domestic implements with which they were interred,—as earthen vessels, hatchets, etc. . . . Here we spread our blankets under the canopy of a star spangled sky; and after a little persecution from the mosquitoes, reposed in peace. Our heads were defended by "Spanish bayonets" (*Yucca aloifolia*). . . . Next morning, crossing the Inlet at the southern point of Penon Island, we ascended upper Matanza river,—which running south 10 or 12 miles close to the sea shore, originates by several heads in the swamps, a little westerly. Tracing the eastern branch, we landed early in the afternoon at the plantation of a Mr. Hernandez. Here, in a thin sandy hammock of small Live Oaks, Cabbage, and Saw Palmettoes, I had the gratification to find the "Wild Sago," or Coontia,[1] of the Seminoles,—and to assign it its place in the sexual system; . . . I have no books with me to refer to; but it is probably a new genus,—approaching very closely in habit to the real Sago family (Cycas)."

We should estimate Baldwin's locality between fifteen and twenty miles north of Daytona or Tomoka as the settlement was then called. Our most northern observed locality is in just about the same latitude. It may occur naturally further north, but at about the latitude concerned the travelable highway turns away from the coastal region and a very different kind of country is traversed all the way to Jacksonville, which place we reached just forty-eight hours after leaving the Cape Sable region.

A survey of the front yards of Jacksonville discovered many fine specimens of *Zamia umbrosa*. It thrives there and is immune to the decidedly cold weather of the winters. Four specimens we examined, still very vigorous, are known to have grown there for over thirty years. Repeated inquiries as to the origin of these cultivated specimens brought no definite information. As

[1] Bow-legs, the grandson of Bartram's "Long Warrior," says, that "Coontia" signifies Bread plant. (This proved to be the *Zamia pumila*. See subsequent letter, of May 27.)

the coastal region from Jacksonville to Saint Augustine and thence to the Halifax River is not accesible by motor-car, we plan to investigate it at as early a period as possible by boat.

JOHN K. SMALL.

PLANT CANCERS

Much interest has recently been aroused by the statement that plants are subject to diseases analogous to the cancers of man. The particular plant disease which gave rise to this statement was the well known crown gall, which produces the so-called cancers, or rather tumors, on many kinds of plants. It attacks especially members of the apple and plum families, including peaches, plums, apples and pears, but also attacks roses, daisies, and castor bean, and is frequently very destructive to red raspberries. The tumors may develop on any part of the plant, but are most abundant on the roots, particularly near the surface of the ground, whence arose the common name crown gall.

This important disease has been known to botanists for nearly a century, and, because of its destructive character, has been the subject of much botanical investigation. Nevertheless, it was not until 1906, that Smith and Townsend discovered the microscopic causal organism, to which the name *Bacterium tumefaciens* has been given. This bacterium is now well known and by modern methods of bacteriological technique it can be isolated and used to inoculate plants.

Studies of crown gall have been in progress at the Botanical Garden for several months, and good specimens of these "plant cancers" may be seen at the propagating house growing on castor bean and Bryophyllum.

The resemblance of crown gall to the human cancer has attracted the attention of the medical profession and has led to renewed energy in the search for a causal organism of cancer. So far this search has been unsuccessful, but it is possible that extensive study or the crown gall and other plant tumors may prove helpful in the effort to discover the cause of human cancer.

MEL. T. COOK.

CONFERENCE NOTES FOR FEBRUARY

The usual monthly conference of the staff and students of the Garden was held in the Museum Building February 7. The program consisted of papers by Dr. W. A. Murrill on "Recent Studies in Dark-spored Agarics," and by Dr. John Hendley Barnhart on "How to Use the Library."

Dr. Murrill presented a key to the eleven genera of dark-spored mushrooms of North America, showing the number of species in each and mentioning the twenty-five new species recently described by him. He also exhibited various publications containing descriptions and figures of representative species in each genus, and pointed out their chief characters.

Several years ago Dr. Murrill completed his investigations of the gill-fungi of tropical North America and of the Pacific Coast, so that these later studies, dealing with the forms occurring in temperate North America exclusive of the extreme west, practically complete the entire series of North American mushrooms, as well as the related polypores and boletes, so far as his personal work is concerned. His monographs are published in *Mycologia*, *North American Flora*, and several handbooks privately printed. A matter of interest to the conference was the fact that four of the numerous new species were discovered within the grounds of the New York Botanical Garden.

Dr. Barnhart called attention to various important bibliographies, indexes, and catalogs of botanical literature which may be of assistance to students desiring information on particular subjects, and discussed the use of the card catalog.

HESTER M. RUSK,
Secretary of the Conference.

PUBLIC LECTURES DURING APRIL

The following public lectures will be presented during April as a part of the regular lectures series annually offered at the Garden.

April 1.	"Rice, the Greatest Food Plant of the World."	Dr. H. A. Gleason
April 7.	"Forestry."	Mr. Barrington Moore
April 8.	Nature Talks—I. "Stars"	Dr. W. A. Murrill

April 14. "The Public's Part in Park Plant Protection"
Mr. K. R. Boynton
April 15. "The Call of the Mountains" Mr. Le Roy Jeffers
April 21. "Some Floral and Scenic Features of Cuba"
Dr. M. A. Howe
April 22. "The Most Important Economic Plants of America"
Dr. H. A. Gleason
April 28. "Spring Wild Flowers" Dr. G. C. Fisher
April 29. "Pasteur and the Founding of Bacteriology"
Dr. G. M. Reed

These lectures, which are open to the public without charge, are held in the Museum Lecture Hall at 4 P. M. They are illustrated by lantern slides or living plants.

NOTES, NEWS AND COMMENT

The second edition of Dr. Rydberg's "Flora of the Rocky Mountains and Adjacent Plains" has recently been published. It presents descriptions of 135 species not included in the first edition, bringing the total flora of the region to over 6,000 species.

Meteorology for January. The total precipitation for the month was 6.70 inches, of which 2.25 inches (22.5 inches by snow measurement) fell as snow. The maximum temperatures recorded for each week were *52° on the 1st*, 41° on the 12th, 50.5° on the 21st, and 40.5° on the 27th. The minimum temperatures were 20° on the 7th, 19° on the 14th, 7° on the 18th, 15° on the 24th, and *6° on the 31st.*

Dr. W. A. Murrill left March 3 for a collecting expedition in Florida. His trip will extend down the west coast from Crystal River to the Keys and back on the east coast as far as Daytona. Chief attention will be given to the collection of fungi.

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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIV April, 1923 No. 280

JOURNAL

OF

The New York Botanical Garden

EDITOR

H. A. GLEASON

Assistant Director

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

Vol. XXIV April, 1923 No. 280.

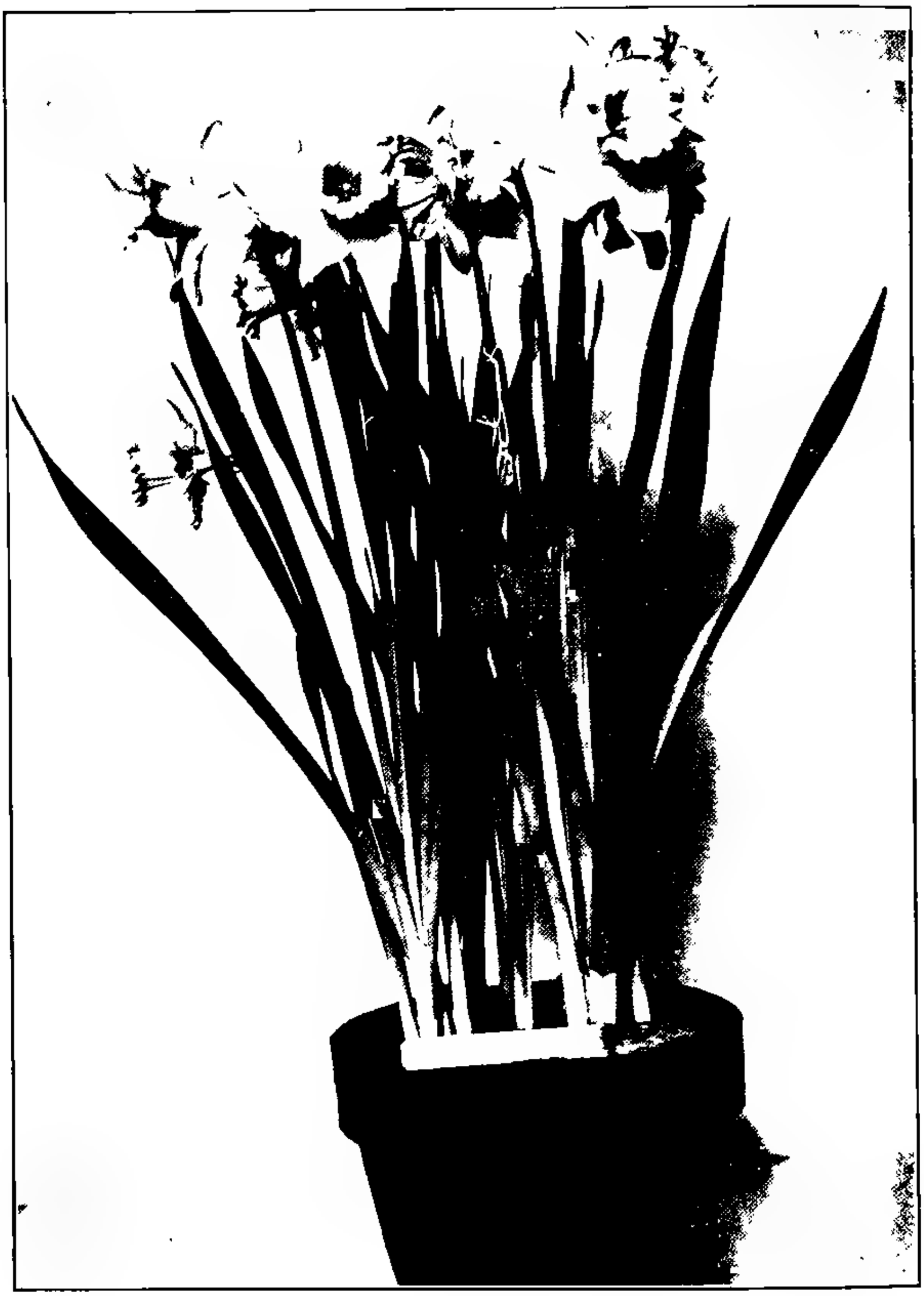
GARDEN FORMS OF NARCISSUS.

Narcissus, a vain youth of mythology, was given to gazing at his charming reflection in limped streams, even refusing to turn his gaze upon a beautiful maiden. As a punishment for his vanity Echo had him changed to a flower, nodding its head on the banks of the stream. This blossom was thenceforth called a Narcissus, and its further connection with those ancient gods is evidenced through the names of some of the botanical sections of the genus, as Ajax, Ganymedes, and Telamonius, Theophrastus, Homer, Sophocles, and Shakespeare have celebrated the Narcissus in song.

Dioscorides, of the first century A. D., was the first to treat of it scientifically. In 1629, Parkinson, in his Paradisus Terrestris gave quaint descriptions and many interesting notes referring to almost one hundred varieties known at that time. Sweet, Salisbury, Ellacombe, and many amateur botanists and horticulturists met and discussed Narcissi at different times in the early part of the last century.

Then Haworth wrote a monograph of them in 1831, published with Sweet's work, "The British Flower Garden" which is to be found in our library. Another early book (1836) containing descriptions of Narcissus is "Amaryllidaceae" by Dean Herbert, one of England's earliest amateur hybridists. His theories and ideas resulting from crossing various sorts of Narcissi were the cause of added interest.

The first specialists, and they were also amateurs, were C. H. Backhouse and J. C. Leeds, business men who grew these plants as a hobby and originated many new varieties. Their work was accomplished approximately between 1840 and 1860.



KING ALFRED DAFFODIL

Narcissus culture received additional impulse through the critical botanical studies of the genus by J. G. Baker, in the Gardener's Chronicle of 1869, and the publication in 1875 of "The Narcissus" by Mr. F. W. Burbridge, another famous Narcissus expert. This work, besides setting forth the culture, botany, and history of the genus, contains nearly fifty colored plates illustrating the different types.

The foremost figure in some respects, in the development of interest in daffodils, was Mr. Peter Barr, an English seedsman. Mr. Barr's interest in these flowers led him to purchase the Leeds seedlings in 1870, and later those of the Backhouse collections; and by such means and by collecting wild forms he formed a collection said to contain 500 species and varieties in 1844, when the first daffodil or Narcissus conference was held by the Royal Horticultural Society. This conference started the Narcissus craze, and today England has daffodil societies in all sections of the country, holding many shows each spring. Mr. Barr's sons offer 400 varieties for sale in their special Narcissus catalogue, including 75 new seedlings; and London and New York use Daffodils by the thousand as cut flowers.

This brings up the question of popular names. These golden flowers of the florist in New York are called by the public "jonquils." This designation really belongs to the many-flowered, smaller, yellow sort, with equal fragrance, but with rush-like cylindrical leaves; not the broad flat strap-like ones of the "daffodil' which name should be applied to these New York flowers and to all large varieties of the genus with great yellow cups or trumpets. They have been daffodils, daffodillies, or daffy-down-dillies for hundreds of years, in popular parlance and are so known by Shakespeare, Milton, Shelley and others.

The daffodils, jonquils, and Narcissi, collectively all are plants of the Amaryllis family, growing from medium-size bulbs, which send up long relatively narrow and grass-like or lily-like leaves and straight hollow stems with straw-like bracts at the apex from which break out in due time from one to twelve blossoms. The flowers are composed mainly of 6 petal-like perianth segments ranging from golden yellow to pure white in color. These petals surround a cup or trumpet of variable size, in color ranging from white through all shades of yellow and purplish red.

Narcissi are used mainly for three purposes, as out-of-door garden spring flowers, for forcing in greenhouses in pots, and in water or bowls of water and gravel in house culture.

CULTURE

Narcissi are grown and may be had in flower from December to May. During two of these six months they appear as gems of our spring gardens; during the other four as pot plants. Of late an observing person would have noticed that by far the most important flower grown in American homes, in fact almost the only one in many, is the paper white or white polyanthus Narcissus. Dealers ranging from bulb specialists to the five and ten cent stores offer these bulbs for sale in greater numbers each year, and shallow art bowls, white gravel, and bulb fibre, used in their growing, are sold at the same season.

It seems, to one accustomed to noticing every floral detail of his daily travel, as though Narcissus bulbs in saucer, pot, or art bowl, occupy every window during the winter. The requirements for cultivating these white Narcissi are simple. The bulbs are placed in shallow bowls, half covered with white gravel or pebbles, and kept moderately moist by continuous applications of water. They will flower in a short time if in good condition. If possible, better results are obtained by placing the bulbs in the dark for a time until roots form and then bringing them to the light.

This method of growing in water was probably brought from China to San Francisco with the so-called Chinese Lily, which, like our Paper White, is also a variety of *Narcissus tazetta*. The Chinese forms have short, colored trumpets, and the bulbs are much larger than those of the Paper White.

Narcissi, especially the daffodils, are used to a great extent for winter and early spring flowering plants. In order to accomplish this they are forced in pans. This method is not recommended for those who dwell in apartment houses, but for suburbanites and others it gives great advantages over water bulb gardens. As soon as possible in the autumn, bulbs of large yellow and other daffodils should be potted up in bulb fibre or moderately rich soil, preferably in 6 inch pans, plunged in ashes or soil, and comfortably covered and left to take root. After being well rooted, they can be brought into the house at intervals

during the winter for flowering. Illuminating gas and an excess of steam heat are enemies to successful house culture.

The possibilities for garden culture of Narcissus are more extensive than for any other spring bulb. One of the advantages for gardeners of limited means comes in the natural increase of plants, one bulb gradually forming a clump around it, which may be divided up, thus affording a ready means of propagation. For the small home flower garden, they should be used in small clumps of from 5 to 20 bulbs located in the hardy perennial beds or borders; for larger gardens, estates or parks, broad masses in beds are advocated; and in Italian, English park or natural continental gardens they are delightful as naturalized subjects in grassy woodland or along streams; however, they are not a part of our New York woods or meadows. In the first sort of garden we should like to advocate the trial of the rare and new types. A dozen bulbs of a new exhibition variety or a rare half-wild type can be had for a few dollars, and by daily care will thrive and draw attention. Horsfield, an English weaver, originated the fine yellow and white daffodil Horsfieldii, and upon his death the little garden yielded 28 bulbs of blooming size and 9

DAFFODIL—QUEEN OF SPAIN

smaller ones. He originated other varieties also. Small clumps should be originally planted between perennials, under the shrubs, or in odd corners, in well prepared soil. Only uniform, strong bulbs should be used. Soil of mellow texture and good drainage is desirable, fertilized with bone meal; or, if animal manure is used, see that the bulbs do not come in direct contact with it. High-class bulbs planted uniformly in broad beds or long drifts give the golden mass effects to go with the Forsythia in spring. General rules are to plant the bulbs as early as October if possible, plant to a depth equal to twice the depth of the bulb from shoulder to base, usually 4 to 6 inches, cover somewhat with light mulch of manure, straw or salt hay, and remove this early in the spring. The plants themselves will do the rest.

VARIETIES

Our collection of Narcissi at the New York Botanical Garden began in 1898 with a gift of forty varieties from Mr. Peter Barr. This gentleman travelled all over the world spreading his daffodil gospel and visited our Garden during that year. The latest addition was a great bed of King Alfred, one of the magnificent new golden trumpets, presented to the Garden by Messrs. Eddy and de Wreede, of Paradise, Pa. These bloom each spring in the Horticultural Gardens, opposite the Fordham Hospital, and four or five standard varieties are arranged in the conservatory court beds. The varieties now found in our plantations are appended, arranged according to the ordinary horticultural sections used by Baker.

Magni-coronati. Large crown, trumpet or cup. Trumpet as long or longer than the petals or perianth segments.

KING ALFRED. Large flower, rich golden color, glistening texture, and frilled trumpet; Horticultural garden.

EMPEROR. A large, all yellow, standard variety, which with the variety next following were originated by Backhouse, and are common all-purpose daffodils of commerce; none better for amateur gardeners.

EMPRESS. Large flowered with snowy white perianth segments and rich golden crown; conservatory court and in flower beds.

ALBICANS. Spain. A pale primrose-colored form of the wild daffodil, slightly nodding; at the elevated railroad border.

GOLDEN SPUR. A yellow trumpet of good color which blooms early; In conservatory court.

GLORY OF LEIDEN. A large trumpet of pale yellow with paler perianth segments; conservatory flower beds.

GRANDEE. A yellow trumpet with pure white segments, fairly late bloomer; conservatory flower beds.

HORSFIELDII. Another yellow trumpet with white segments; conservatory flower beds.

MME. PLEMP. A long golden trumpet with white perianth, medium late; conservatory flower beds.

VICTORIA. This bicolor is a standard sort and has large trumpets and broad cream-white segments; conservatory court and conservatory flower beds.

Medio-coronati. Medium or chalice cup or trumpet, about half as long as perianth segments.

BARRII CONSPICUUS. This variety is representative of the Barrii group. Long tubes at right angles to the stem, broad, spreading, sulphur-yellow segments, and shorter, broad cups, about ¼ inch long, with reddish rims; court and beds.

INCOMPARABILIS CYNOSURE. A representative of the *incomparabilis* section. Yellow segments and orange cups about half as long. White and orange; conservatory flower beds.

INCOMPARABILIS LUCIFER. A white perianth; orange cupped incomparabilis with tall stems conservatory flower beds.

INCOMPARABILIS SIR WATKIN. A tall strong, large flowered incomparabilis with sulphur perianth and yellow cup, orange rimmed.

LEEDSII MRS. LANGTRY. Leedsii sorts have white or pale half trumpets, somewhat nodding. Mrs. Langtry is primrose, almost white; conservatory flower beds.

Parvicoronati. Small cup, crown or trumpet; cup much less than half the perianth segments almost reduced to a mere rim.

BIFLORUS. Primrose peerless narcissus, each stalk two flowered, cream white to primrose; conservatory flower bed No. 8.

POETICUS. Poet's narcissus or pheasant's eye, white with reddish purple rim of cup. Latest of our narcissi. Found in conservatory flower beds.

POETICUS ORNATUS. An earlier variety of Poet's, with glistening curved perianth segments, and deep red rim to its cup. Many groups will be found in conservatory flower beds and court.

POETAZ ELVIRA. An example of the new hybrid group hardy variety with the many flowered stalks of the polyanthus; conservatory flower beds.

DOUBLE-FLOWERED

VON SION. The old double yellow daffodil, the *Telamonius plenus* of Parkinson, common in gardens and fine for forcing. Found in conservatory court.

RARE TENDER SPECIES

Dr. Stout has flowered the following remarkably rare, not hardy species, in his experiments in fertility and sterility.

NARCISSUS BULBOCODIUM MONOPHYLLUS. The white Hoop-petticoat, small flowers with fringed large trumpets but narrow short perianth segments. Native of Algeria.

NARCISSUS CYCLAMINEUS. Lost for nearly 300 years, rediscovered in Spain in 1887. A dainty little yellow flower with reflexed petals.

NARCISSUS TRIANDUS. Queen of Spain. Small yellow flower with partially reflexed petals, variety being called a natural hybrid by Mr. Barr who found it in Spain.

NARCISSUS JUNCIFOLIUS. Rush-leaved daffodil, another small yellow-flowered type, with flat cup. From Spain and Southern France.

NARCISSUS MOSCHATUS. The rare lesser white Spanish daffodil.

NARCISSUS MINIMUS. The dwarf daffodil, a rock garden species with small yellow flowers.

NARCISSUS BULBOCODIUM CITRINUM. The sulphur-yellow hoop-petticoat daffodil.

The narcissus season in the New York Botanical Garden varies greatly with our variable spring, for we record April 6, 14,30, May 11, 15, for kinds flowering at the same time. At least two or three weeks difference has been shown of late years, but the last third of April will probably see most of them in bloom.

KENNETH R. BOYNTON.

PUBLICATIONS OF THE STAFF, SCHOLARS AND STUDENTS OF THE NEW YORK BOTANICAL GARDEN DURING THE YEAR 1922.

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—— - *Xylophylla epiphyllanthus*. Addisonia **7**: 31. 25 S 1922. *pl. 240.*

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——— Some edible cup-fungi. Jour. N. Y. Bot. Gard. **23**: 112-115. *pl. 274.* Issue for Au 1922.
——— Studies in tropical ascomycetes—I. *Neopeckia diffusa* and *Herpotrichia albidostoma.* Mycologia **14**: 235–238. *pl.; 19.* 1 S 1922.
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CONFERENCE NOTES

The March conference of the staff and students of the Garden was held in the Museum Building on the afternoon of March 7. The program consisted of papers by Dr. Marshall A. Howe on "The Ricciaceae of North America," and by Dr. P. A. Rydberg on "Solanum, Subgenus Tuberaria, in North America."

Dr. Howe reviewed No. 1 of Vol. 14 of the North American Flora, which was published last January and which includes, in addition to a systematic treatment of the Ricciaceae written by him, descriptions of the remaining families, genera and species of the Marchantiales contributed by Professor Alexander W. Evans, and the Sphaerocarpales prepared by Miss Caroline C. Haynes and the speaker. The Ricciaceae are represented in North America, so far as is now known, by three genera: Riccia, with 25 species; *Ricciocarpus*, with 1 species: and *Oxymitra*, with 1 species. *Riccia albida* Sulliv. has recently been rediscovered in Texas by Professor F. McAllister. Its whiteness, which is recognized in its name, is due to a calcification of the walls of one or more layers of cells of its dorsal surface. It is the only bryophyte known to the speaker in which there is a calcification comparable to that found in certain families of the marine algae—in which the lime is not merely an external accretion but is deposited in the cell-walls as one of the products of the metabolism of the plant. The talk was illustrated by specimens and photographs and by drawings made by the speaker and by Miss Haynes.

A detailed account of Dr. Rydberg's subject will be published in a later issue of the Journal.

HESTER M. RUSK,
Secretary of the Conference.

PUBLIC LECTURES DURING MAY

The following public lectures will be presented during May as a part of the regular lecture series annually offered at the Garden.

May 5. "Books on Gardening," Dr. J. H. Barnhart.
May 6. "Bees and Bee Culture," Prof. G. C. Norton.
May 12. Nature Talks—II. "Rocks," Dr. W. A. Murrill.
(Exhibition of Spring Flowers, May 12 and 13)
May 13. "Daffodils and Tulips," Mr. K. R. Boynton.
May 19. "Practical Hints on Garden Design," Miss E. L. Lee.
May 20. Nature Talks—III. "Soil," Dr. W. A. Murrill.
May 26. "The Tea Gardens of Ceylon and Japan," Dr. H. A. Gleason.
May 27. "Wild Flowers," Mr. L. W. Brownell.

NOTES, NEWS AND COMMENT

An interesting museum object made partly of the sporophore of a bracket fungus (*Elfvingia tornata*) was presented to the Garden by Dr. Tanaka, one of the associate editors of *Mycologia*, when he passed through New York late in July on his way to Japan. The sporophore was cut and hollowed out to form a pouch for tobacco, and attached to it by a cord was a pipe-case made of veneered wood. This species of bracket fungus is as common in the Orient as the artists' sketching fungus (*Elfvingia megaloma*) is in America; and, according to Dr. Tanaka, is abundantly used for the manufacture of small boxes, trays, etc., in the prefecture of Ehime on the Shikoku Island, where the museum object mentioned above was purchased.

A series of four lectures was recently given by Dr. W. A. Murrill to the Girl Scouts. His subjects were "Shade Trees," "Wild Flowers," "Edible and Poisonous Fungi," and "Cultivated Flowers."

Dr. Murrill's lecture on "Wood-rot Fungi" given before the Tree Protection Institute on March 1 at New Haven, Conn., was attended by about seventy-five people, including superintendents of estates and other tree-workers. The program included a number of lectures and an excellent luncheon at Dwight Hall which had been arranged by Dr. Tilley and Dr. Clinton. The discussion about the gipsy-moth was especially interesting because plans were laid to keep the pest out of New York City by establishing a barrier zone across the State of Connecticut.

The following botanists registered in the library during the winter months: Prof. A. S. Hitchcock, Messrs. W. W. Eggleston, G. Hamilton Martin, Jr., and L. W. Schwarz, Washington, D. C., Mr. Chas. C. Deam, Bluffton, Ind., Prof. H. M. Fitzpatrick, Ithaca, N. Y., Prof. Caroline A. Black, Connecticut College, Mr. L. R. Waldron, Fargo, N. D., Prof. W. C. Coker, University of North Carolina, Miss Margaret D. Brown, Halifax, N. S., Mr. Carlos E. Chardon, San Juan, Porto Rico, and Prof. Eduardo Quisumbing, University of the Philippines.

Meteorology for February. The total precipitation for the month was 1.92 inches, of which 1.54 inches fell as snow (13.5 inches by snow measurement and 0.19 inch melted snow). The maximum temperatures were 42° on the 2nd, 44° on the 9th, 44° on the 14th and *46° on the 25th.* The minimum temperatures were 15° on the 4th, 11° on the 6th, *7° on the 18th and 7° on the 24th.*

The Florida stinking cedar, *Tumion taxifolium*, near the door in the central display house, Range No. 2, has taken on a coat of new growth of light green tips of fresh foliage on the branches.

The Lady Banks rose, double white-flowered form, has been blooming on the north wall of the central display house, and reminds us that it will soon be time to watch for the beautiful single yellow *Rosa Hugonis*, which heralds the approach of the rose season, and may be seen about May, 12, in the single rose row at the back of the rose garden.

Dr. J. K. Small and Dr. Arthur Hollick attended the convention of the American Association of Museums at Charleston during the first week in April.

The lace-bark tree (*Lagetta lagetto*) is now an interesting display feature of house no. 3 of range 1. Here one may see its beautiful chains of fragrant white, tubular flowers, though it is to the lace-like texture of the very fine layers of inner bark that its name and great usefulness in Janaica are due. Many small articles are made from this fine natural fabric in the West Indies.

ACCESSIONS

Library Accessions from Sept. 21, 1922—Jan. 31, 1923.

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Blatter, Ethelbert, & d'Almeida, J. F. *Ferns of Bombay.* Bombay, 1922. (Given by the Torrey Botanical Club.)

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Britton, Nathaniel Lord, & Rose, Joseph Nelson. *The Cactaceae,* Vol. 3. Washington, 1922. (Given by Dr. N. L. Britton.)

Castle, William Ernest. *Genetics and eugenics.* Ed. 2. Cambridge, 1922.

Chase, Mary Agnes (Merrill). *First book of grasses.* New York, 1922. (Given by Miss Katharine Kimball.)

Conn, Herbert William. *Agricultural bacteriology.* Ed. 3. Philadelphia, 1918.

Contributions to Canadian biology, 1906–20. Ottawa, 1912-21. (Given by the Department of Marine and Fisheries.)

Downing, Andrew Jackson. *Landscape gardening.* Ed. 10. Revised by Frank Waugh. New York, 1921.

Ernst, Alfred. *Bastardierung als Ursache der Apogamie im Pflanzenreich.* Jena, 1918.

Giltner, Ward. *Laboratory manual in general microbiology.* Ed. 2. New York, 1921.

Greene, Edward Lee. *Carolus Linnaeus.* Philadelphia, 1912.

Harshberger, John William. *Student's herbarium for descriptive and geographic purposes.* Philadelphia, 1901.

Harshberger, John William. *Text-book of pastoral and agricultural botany.* Philadelphia, 1920.

Harshberger, John William. *The vegetation of the New Jersey Pine-Barrens.* Philadelphia, 1916.

Huntington, Ellsworth, & Visher, Stephen Sargent. *Climatic changes; their nature and causes.* New Haven, 1922.

Huxley, Leonard. *Life and letters of Thomas Henry Huxley.* 2 vols. New York, 1900. (Given by Mrs. N. L. Britton.)

Kemp, Edward. *Landscape gardening.* Ed. 4. Edited, revised and adapted to North America by F. A. Waugh. New York, 1911.

MARSHALL, CHARLES EDWARD. *Microbiology*, Ed. 3. Philadelphia, 1921.

MATTHEWS, JOSEPH MERRITT. *The textile fibres: their physical, microscopical and chemical properties.* Ed. 3. New York, 1913.

MERRILL, ELMER DREW. *A bibliographic enumeration of Bornean plants.* Singapore, 1921. (Given by the author.)

NICHOLSON, KATHARINE STANLEY. *Historic American trees.* New York, 1922.

PACK, CHARLES LATHROP. *The school book of forestry.* Washington, 1922. (Given by the author.)

PACK, CHARLES LATHROP. *Trees as good citizens.* Washington, 1922. (Given by the author.)

PERCIVAL, JOHN. *The wheat plant.* New York. n. d.

POPENOE, FREDERICK WILSON. *Manual of tropical and subtropical fruits.* New York, 1920.

RECORD, SAMUEL JAMES. *Identification of the economic woods of the United States.* Ed. 2. New York, 1919.

RECORD, SAMUEL JAMES. *The mechanical properties of wood.* New York, 1914.

Report of the Department of science and agriculture of British Guiana. 1913 14 to 1919. Georgetown, 1915–21. (By exchange with the Department of Agriculture of British Guiana.)

ROBBINS, WILFRED WILLIAM. *The botany of crop plants.* Philadelphia, 1917.

SARGEAUNT, JOHN. *Trees, shrubs and plants of Virgil.* Oxford, 1920. (Given by Dr. W. G. Thompson.)

SCHNEIDER, ALBERT. *Microanalysis of powdered vegetable drugs.* Ed. 2. Philadelphia, 1921.

STEFANSSON, VILHJALMUR. *The friendly Arctic.* New York, 1921. (Given by Mrs. N. L. Britton.)

TRELEASE, WILLIAM. *Plant materials of decorative gardening.* Ed. 2, rev. Urbana, 1921. (Given by the author.)

WARD, HENRY BALDWIN, & WHIPPLE, GEORGE CHANDLER. *Fresh-water biology.* New York, 1918.

WILLIS, JOHN CHRISTOPHER. *Age and area: a study of geographical distribution of species.* Cambridge, 1922.

WINKLER, HANS. *Verbreitung und Ursache der Parthenogenesis im Pflanzen-und Tierreiche.* Jena, 1920.

YOUNGHUSBAND, FRANCIS EDWARD. *The heart of nature.* New York, 1922. (Given by Mrs. N. L. Britton.)

ZOLLICKOFFER, WILLIAM. *A materia medica of the United States.* Baltimore, 1819. (Given by Dr. J. H. Barnhart.)

PLANT AND SEED ACCESSIONS

1 plant of *Livistona chinensis* for Conservatories. (Given by Mrs. Chas. Mallory.)

10 plants of *Hemerocallis* from Peru for Conservatories. (Given by Mr. W. H. Staver.)

4 plants of *Agave*. (Given by Mr. A. H. Sievers.)
5 plants of *Begonia* for Conservatories. (Given by Mr. F. E. Metzler.)
1 plant for iris garden. (Given by Mr. J. C. Wister.)
1 plant of *Myrtus* for Conservatories. (Given by Miss C. S. Seifert.)
2 plants for rock garden. (Given by Rev. H. M. Denslow.)
5 plants for iris garden. (Given by Mr. G. E. Shoemaker.)
18 cactus plants for Conservatories. (Given by Mr. Arthur Hunter.)
152 plants for new lilac garden. (Purchased.)
40 plants for Conservatories. (By exchange with U. S. Nat. Musuem through Dr. J. N. Rose.)
41 plants for Conservatories. (By exchange with Dept. of Parks, Manhattan.)
5 plants of *Quercus* from Staten Island. (Collected by Dr. A. Hollick.)
1 plant from Bolivia. (Collected by Dr. H. H. Rusby.)
1 packet of seed. (Given by Mrs. Samuel Sloan.)
1 packet of *Hibiscus* seed. (Given by Mr. Wm. W. Heaton.)
1 packet of *Rhododendron* seed. (Given by Mr. Fred Whitman.)
2 packets of seed. (Given by Dr. N. H. Cowdry.)
1 packet of *Gingko biloba* seed. (Collected by Mrs. E. G. Britton.)
1 packet of spores. (By exchange with Dr. A. G. Stokey.)
1 packet of *Sabal texana* seed. (Collected by Dr. R. Runyon.)
1 packet of seed. (Collected by Dr. J. K. Small.)
99 *Dahlia* plants, 52 varieties, and 27 *Dahlia* roots, 24 varieties. (Given by Mr. Wm. J. Matheson.)
76 *Dahlia* roots, 40 varieties. (By exchange with Dr. M. A. Howe.)
24 *Dahlia* roots, 14 varieties. (Given by Mr. J. J. Broomall.)
19 *Dahlia* plants, 10 varieties, and 4 *Dahlia* roots, 3 varieties. (By exchange with David M. Benford.)
18 *Dahlia* roots, 12 varieties. (Given by Mr. C. Louis Alling.)
16 *Dahlia* roots, 12 varieties. (Given by Dahliadel Nurseries.)
15 *Dahlia* plants, 12 varieties, and 11 *Dahlia* roots, 11 varieties. (Given by Dr. L. Hosford Abel.)
15 *Dahlia* roots, 8 varieties. (Given by Babylon Dahlia Gardens.)
14 *Dahlia* plants, 8 varieties. (Given by W. H. Waite.)
13 *Dahlia* roots, 6 varieties. (Given by Walker Bros.)
12 *Dahlia* plants, 6 varieties. (Given by Mr. Wm. F. Jost.)
11 *Dahlia* roots, 8 varieties. (Given by Mrs. S. C. Mastick.)
9 *Dahlia* roots, 8 varieties. (Given by Mr. Geo. L. Stillman.)
9 *Dahlia* roots, 8 varieties. (Given by Slocombe's Dahlia Gardens.)
8 *Dahlia* roots, 6 varieties. (Given by Mrs. Charles H. Stout.)
8 *Dahlia* roots, 8 varieties. (Given by Mr. L. D. G. Smith.)
6 *Dahlia* roots, 3 varieties, and 4 *Dahlia* plants, 2 varieties. (Given by Mills & Co.)
5 *Dahlia* roots, 4 varieties. (Given by Mr. Myron E. Douglas.)
5 *Dahlia* roots, 3 varieties. (By exchange with Dr. John K. Small.)
5 *Dahlia* roots, 5 varieties. (By exchange with Mr. L. H. DuBois.)
4 *Dahlia* roots, 4 varieties. (Given by Mr. John Layman.)
4 *Dahlia* plants, 4 varieties. (Given by C. Frey).

4 *Dahlia* plants, 4 varieties. (By exchange with Mr. W. N. Corby.)
3 *Dahlia* roots, 3 varieties. (Given by Mr. C. Wadsworth.)
3 *Dahlia* roots, 3 varieties. (Given by Meachen & Sherman.)
2 *Dahlia* roots, 2 varieties. (Given by Bessie Boston Dahlia Farm.)
2 *Dahlia* roots, 2 varieties, and 4 *Dahlia* plants, two varieties. (Given by Alt. F. Clark.)
2 *Dahlia* roots, 1 variety. (By exchange with Dr. Romeo Roberto.)
1 *Dahlia* root, 1 variety. (Given by Stewart & Fisher.)
1 *Dahlia root.* (Given by Mr. A. Hentschel.)
1 *Dahlia* root. (By exchange with Mr. J. Otis Ball.)

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Fritz Achelis
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I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....

Vol. XXIV May, 1923 No. 281

JOURNAL

OF

The New York Botanical Garden

EDITOR

H. A. GLEASON

Assistant Director

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

INTELLIGENCER PRINTING COMPANY

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JOURNAL

OF

The New York Botanical Garden

VOL. XXIV May, 1923 No. 281

BOTANICAL EXPLORATION OF PORTO RICO AND THE VIRGIN ISLANDS

TO THE SCIENTIFIC DIRECTORS OF THE NEW YORK BOTANICAL GARDEN,

Gentlemen:—As a further contribution to our continued cooperation with the New York Academy of Sciences, Columbia University, the American Museum of Natural History, the Insular Government of Porto Rico, and the Government of the Virgin Islands of the United States, I was absent from the Garden, with permission of the Board of Managers, from January 20th to April 9th, 1923, engaged in botanical exploration and collecting in Porto Rico, St. Thomas and St. Croix; this work being a part of the Scientific Survey of Porto Rico and the Virgin Islands, initiated several years ago by the New York Academy of Sciences. This Academy has published noteworthy contributions to the geology and palaeontology of these islands, now to be followed by the botany, of which we have the first part in press, containing descriptions of the wild and cultivated plants and of their products useful in the sciences and industries, written by me, with assistance of Mr. Percy Wilson, Associate Curator. Other parts may follow promptly, as the manuscript is largely completed. I was accompanied by Mrs. Britton, who continued her studies of mosses and aided in the collection and preservation of plants and specimens, and by Dr. Fred J. Seaver, Curator, in charge of our mycological collections, who went as a guest of the Porto Rico Government, to increase knowledge of the fungi. Professor James F. Kemp of Columbia University, and a member of our Board, joined us on March first, and while diligently occupied in geological investigations, gave much attention to the botanical work.

Our primary objects were to render more complete the descriptions of the plants and the records of their distribution as governed by soil, rainfall and altitude, and to increase our collections of West Indian species of especial interest; these studies led us over much territory, from sea-level to the mountain summits, and they have demonstrated the occurrence in Porto Rico and in the Virgin Islands of a considerable number of species not hitherto known from the region, including some new to Science; the fungus collections made by Dr. Seaver especially contain much of novelty. Our work was everywhere facilitated by aid and information from government officials and from civilians.

In Porto Rico we were cordially welcomed and aided by Hon. Juan B. Huyke, Acting Governor and Commissioner of Education; by Hon. Leopoldo Feliu, Commissioner of Agriculture and Labor, and by Hon. John A. Wilson, Commissioner of the Interior. Important facilities for study and delightful hospitality were provided by Mr. Rafael Menendez Ramos, Director of the Insular Agricultural Experiment Station at Rio Piedras, and Mrs. Menendez; by Mr. D. W. May, Director of the Agricultural Experiment Station at Mayaguez, and Mrs. May; and by Professor C. W. Horne, Dean of the College of Agriculture and Mechanic Arts at Mayaguez, and Mrs. Horne, and we were privileged to see the series of beautiful water-color paintings of Porto Rico plants made by Mrs. Horne; one of these (*Crotalaria retusa*) we have already reproduced in "*Addisonia*" and others are available; we were especially fortunate in obtaining from a tree of *Phlebotaenia Cowellii*, the wonderfully elegant Violet Tree, endemic in Porto Rico, standing on a river-bluff at Rio Caña, between Juana Diaz and Coamo, both its flowers and its fruit, for painting by Mrs. Horne. We were also guests of the Porto Rico University at Rio Piedras and took great pleasure in addressing a general assembly of the University, Professor Kemp speaking on the Geology of Porto Rico, after I had discussed the progress of the Scientific Survey and the forestry problems of the islands, and followed by Mrs. Britton, who gave the several hundred young people assembled the best of advice in fluent Spanish.

Mr. E. Murray Bruner, Forester of Porto Rico, and Mrs. Bruner organized for us a visit of four days (February 23-26)

to the Luquillo Mountains, using the forest rangers' cabins at about 1200 feet elevation on the Catalina-Yunque trail as a base, and including an ascent of El Yunque Mountain. On this trip we were accompanied and aided by Mr. Bruner and by Professor Dale of the Porto Rico University. We made large and important botanical collections under very favorable conditions, despite a drenching rain-storm encountered on the rocky summit of the mountain which operated to restrict our collecting there. We secured specimens nevertheless of most of the characteristic plants, including a minute and quite unexpected bladderwort detected among mosses by Mrs. Britton, and the grass *Panicum fusiforme* hitherto unrecorded from Porto Rico. A detailed description of the vegetation of El Yunque will find place elsewhere. It is one of the most attractive mountains of the West Indies with a wealth of species of ferns, mosses and hepatics; for its rainfall is the highest in Porto Rico and the consequent luxuriance of its vegetation is wonderful. Mr. Bruner has recently constructed a stoned trail nearly to its summit as a part of some thirty miles of trails through the Luquillo Forest Reserve built under his direction, and the mountain and its vegetation are thus much more readily accessible than they formerly were.

Mr. Robert B. Noyes, of Ponce, organized for us a visit to the mountain forests in the Cordillera Central, north of Ponce, near Jayuya, using his coffee plantation, San Narciso, as a hospitable base for three days; and we were thus enabled to make large collections in these mountains. We also reached from Ponce other high altitudes in the Cordillera Central and studied the forest at Indiera Baja on the new road running north from Yauco and also made collections in the valley of the Toro Negro on the road running north from Juana Diaz. Collections were also made near the southern coast on the very dry hills in the vicinity of Ponce and Guayanilla, where *Badiera Penaea*, a shrub of the gay-wings family was detected, not hitherto recorded from Porto Rico. It was found by us just in time to be recorded by Dr. S. F. Blake in his monograph of this family in "North American Flora."

Don Jorge Bird Arias organized for us a visit to Icacos Cay, a limestone island off Cape San Juan, the northeastern point of Porto Rico, which we reached by his motor-boat from Fajardo.

It is very interesting botanically, several species of plants being found there which are not known to inhabit the mainland of Porto Rico. The limestome is bright white and a very pure carbonate of lime.

Delightful hospitality and opportunity to study hills in the vicinity of Arecibo and Barceloneta geologically and botanically were provided for us by Don Andres Oliver of Arecibo. Visits were made to other hills of the Arecibo limestone at several points between San Juan and Manati and to several places on the northern coastal plain, for further studies of the extensive areas of white sand and their characteristic vegetation. In my narrative of work in Porto Rico a year ago,[1] I suggested that this white sand had been derived from the erosion of the limestone hills: and now Professor Kemp has found confirmation of this in one of the hills near Martin Pena, where the sand was seen in layers between those of limestone.

We gave especial attention to studies of cultivated plants in order to make our records of exotics more complete. The collections of the Agricultural Experiment Stations at Mayaguez and at Rio Piedras and those of the Forest Service were examined anew. The plants in the Governor's Garden and of the Porto Rico Nursery Company at Rio Piedras, and those in the plazas of several cities, and in the gardens of several hotels were observed, and we had the pleasure of studying many beautiful private places, among them that of Mr. and Mrs. F. T. Maxwell at Ensenada where a truly wonderful result has been reached in the transformation of a dry rocky hill on the harbor of Guanica into a luxuriant and elegant garden, primarily by the planting of many cocoanut palms several years ago, which soon provided under irrigation the requisite shade for the present varied planting. At Naguabo we were guests of Mr. Harold I. Sewell, who now, as on a previous occasion when we explored the Naguabo Mountains,[2] facilitated our work by kind hospitality and valued information. His use of the Porto Rico Royal Palm (*Roystonea borinquena*) planted in a semicircle fronting his residence is original and elegant, and his success in growing mangosteens (*Garcinia* sp.) is an important horticultural

[1] Journ. N. Y. Bot. Gard. **23**: 56. 1922.
[2] Journ. N. Y. Bot. Gard. **15**: 102. 1914.

experiment. At Miraflores we studied the luxuriant garden of Mr. Antonin Nechodoma, where many native and exotic orchids flourish and flower profusely; we much regretted our inability, for lack of time, to accept his invitation to visit his mountain home in the Luquillo Mountains where he is jealously preserving an extensive area of primeval forest on the headwaters of the Mameyes River, one of the few large streams which remains forest-protected.

The garden of the Misses Noble at Condado afforded us opportunity to study a number of species not seen elsewhere, and the hospitality tendered us by them and by their brothers was most enjoyable. Mr. David Noble was particularly active in our behalf, and his intimate knowledge of Porto Rico was very important to us. He, especially, made it possible for Professor Kemp to prosecute his geological investigations over wide areas without loss of time, and he conducted us to several botanically very interesting localities.

We spent a week on St. Thomas and another on St. Croix, pursuant to kind invitation from Captain H. H. Hough, U. S. N., Governor of the Virgin Islands of the United States of America, and to him and to Mrs. Hough we are deeply grateful for delightful hospitality, important information and valued facilities for our work. We crossed from San Juan by steamer to St. Thomas March 9 and returned to San Juan March 26. We had formerly made large botanical collections on St. Thomas;[1] and during this visit especial attention was paid to plants under cultivation in parks and gardens and particularly to the noteworthy collections recently brought together by Mr. Arthur S. Fairchild at his estate Louisenhöj at about 800 feet altitude. His garden has a superb setting, commanding charming views over the sea to the north and to the south and surrounding an old Danish mansion which he has in process of renovation and modification into an elegant modern residence; he is keeping records of the success, complete or partial, in establishing species hitherto not in cultivation in the West Indies, and also of the failures; of the origin from various sources of all plants brought in, and of their growth from year to year. He has cooperated with us in experimenting with many species sent

[1] Journ. N. Y. Bot. Gard. **14**: 99. 1913.

to him from the New York Botanical Garden and from the United States Department of Agriculture, and altogether is making a highly valuable contribution to tropical horticulture. We much enjoyed his companionship and hospitality, as also that of Mr. and Mrs. Axel Holst, whose garden was studied with interest and appreciation and who aided us by guidance to interesting localities and by information. We are also grateful for kind attention to Rev. A. B. Romig who had previously facilitated our studies of St. Thomas in 1913.

Proceeding by steamer to St. Croix, we found that our comfort and convenience had been anticipated by Governor Hough placing by radio the facilities of the old government house at Christiansted at our service, under the kind and cordial supervision of Lieut. C. E. Rappolee, U. S. N., Despatching Secretary, and to him and to Mrs. Rappolee we are grateful for highly valued aid and information, as also to Lieut. John C. Gebhard, U. S. N., of the Civil Engineering Corps. Through their cooperation we were enabled to make large geological and botanical collections at many points, the extensive and well maintained road system of the island providing easy access to most districts. Our knowledge of the vegetation of St. Croix had, previous to this visit, been for the most part derived from specimens and published records obtained by other botanists, Danish and American; I had been ashore there for only a day, in company with the late Mr. John F. Cowell in 1901. The plant collections at the St. Croix Agricultural Experiment Station, now directed by Mr. J. B. Thompson, were studied with much interest, and some species were seen there not known to us to be in cultivation elsewhere in the West Indies. Mr and Mrs. Thompson guided and accompanied us to several attractive and instructive botanical localities. To Mr. Folmer Andersen, Manager of the Bethlehem Sugar Company, we are grateful for kind hospitality and for guidance to localities on the estate under his direction, including an ascent of Mt. Eagle (1190 feet), the highest point on the northern mountain range, which enabled us to study portions of the small areas of natural forest remaining. We are also grateful for kind attentions to Captain R. H. Jeschke, U. S. Marines, and Mrs. Jeschke and to Mr. H. B. Nelthrope and his family.

We have brought back with us specimens of over 2000 separate collections of museum and herbarium specimens, seeds, fruit and living plants, aggregating over 5000 individual specimens, of which about one-half are fungi, collected by Dr. Seaver, whose report is hereto appended.

Respectfully submitted,

N. L. BRITTON.
Director-in-Chief.

MYCOLOGICAL WORK IN PORTO RICO AND THE VIRGIN ISLANDS

DR. N. L. BRITTON, *Director-in-Chief*:

Sir: At the request of the Insular Government and with your permission, on January 20, I sailed on the San Lorenzo to accompany you as "Technologist in charge of special work on fungi of Porto Rico" later extended to include the Virgin Islands.

Probably more mycological work has been done in Porto Rico than in any other island of the American tropics. A summary of this work appeared in 1918 in the form of a check list of the fungi by J. A. Stevenson at that time connected with the experiment station.[1]

For some time past a revision and extension of this work has been under way by the writer in cooperation with Mr. Carlos E. Chardon, Sugar Expert for the Insular Experiment Station. Mr. Chardon is a graduate of Cornell University and during his stay there made a critical study of the mycological material collected by Professor H. H. Whetzel and Dr. E. W. Olive in Porto Rico in 1916. As a result of these studies and his first hand knowledge of the fungi of his home land, Mr. Chardon is unusually fitted to cooperate in this work.

Through the efforts of Mr. Chardon and Mr. Rafael Menendez Ramos, Director of the Experiment Station at Rio Piedras, an appropriation was voted by the Insular Government to defray the expenses of a trip to Porto Rico in company with yourself

[1] A check list of Porto Rican fungi and a host index. Jour. Dept. Agr. Porto Rico **2**: No. 3. 1918.

in order to make more nearly complete our knowledge of the fungi of the islands. The following instructions were received by me (details omitted):

Dec. 18, 1922.

Dr. Fred J. Seaver,
New York, N. Y.

Sir:—You are hereby authorized and directed to proceed from New York City to San Juan, Porto Rico, for the purpose of conducting a series of investigations aiming to make more complete the knowledge of fungi in Porto Rico, especially those which are destructive to vegetation and more especially to coffee and citrus fruits.

The traveling expenses hereby enjoined are necessary for the public service and said expenses are estimated not to exceed $1000.

Your actual transportation expenses from New York City to San Juan, and from San Juan back to New York City, as well as all necessary expenses made in performance of your official duties while in Porto Rico will be paid by the Insular Government.

Respectfully,
RAMON GANDIA CORDOVA,
Acting Commissioner of Agriculture and Labor.

Approved: JUAN B. HUYKE,
Acting Governor of Porto Rico.

In accordance with the foregoing instructions, the work was undertaken covering essentially the same ground covered by you in your work on the higher plants (see previous report). Although not politically a part of Porto Rico, the Insular Government very kindly extended to me the privilege of spending two weeks in the Virgin Islands (formerly the Danish West Indies). This work was of especial interest owing to the fact that comparatively little mycological work had been done in these islands and none, so far as we know, by American mycologists. The most extensive mycological work published on these islands is by C. Ferdinandsen and O. Winge.[1]

[1] Fungi from the Danish West Indies collected 1905–1906, Part 1. Bot. Tidssk. **29**: 3–25, pl. 1, 2. 1908.

One week was spent on the island of St. Thomas and one week on St. Croix. The conditions here are at best arid and our visit occurred in the dryest part of an unusually dry season. But in spite of the rather unfavorable conditions and the limited time the two weeks work will result in a substantial increase in the number of species of fungi known from these interesting little islands.

The total of the approximately ten weeks work in Porto Rico and the Virgin Islands has resulted in the collection of more than a thousand numbers of fungi, all of which will be subjected to a microscopic study and the results incorporated in more technical and detailed reports to be published from time to time as the results become available. This work will result in bringing to light many species, genera, and even families not before known to occur in these islands as well as a considerable number of species not previously known to science.

Respectfully submitted,

FRED J. SEAVER,

Curator.

COMPLIMENTARY DINNER TO DR. THOMPSON.

Dr. W. Gilman Thompson, president of the New York Botanical Garden from 1913 to 1923, was tendered a dinner by the Board of Managers April 12 in the rooms of the Century Association. At the conclusion of the dinner he was presented with two handsome pieces of antique silver plate and with an engrossed copy of the following resolutions:

WHEREAS: After distinguished service as President of The New York Botanical Garden for a period of ten years, Dr. W. Gilman Thompson has declined re-election to this office in order to be able to give closer attention to his professional duties, and in particular the building, development and operation of the new Reconstruction Hospital, with which he is intimately identified, and the expanding work of The New York Academy of Medicine; and

WHEREAS: Notwithstanding his broad professional interests, he has throughout his presidency of the Garden given its development and maintenance devoted attention, having its affairs constantly in mind and its welfare at heart, having participated, with rare exceptions, in all meetings of the Board of Managers, of the Corporation, and of committees of which he has been a member, wise in counsel and fertile in suggestion, be it

RESOLVED: That the Managers of The New York Botanical Garden hereby record their cordial appreciation of Dr. Thompson's services as President and express their hope that he will long continue to give the Garden the benefit of his experience and discerning judgement.

FREDERIC S. LEE, *President*,
JOHN L. MERRILL, *Treasurer*,
N. L. BRITTON, *Secretary*.

ANNUAL SPRING INSPECTION

The annual Spring Inspection of the New York Botanical Garden by the Board of Managers, the Advisory Council, the members, and invited guests was held Thursday, May 10. The party proceeded first to conservatory range 1, where members of the staff pointed out some of the features of special interest. A handsome plant of *Medinilla magnifica* in full bloom attracted much attention. The new rock garden, now approaching completion, was next visited under the guidance of Dr. E. B. Southwick, who has had charge of its construction and development. Driving past the Pelham Parkway frontage of the Garden, the party had opportunity to see the recent important development of that part of the tract, especially in the construction of paths, boundary fence and entrances, and new planting. Leaving the motor-cars near the suspension bridge, the visitors then walked through the hemlock forest, where Dr. H. A. Gleason explained the investigations recently initiated to determine conditions affecting the growth of the hemlock trees. Tea was then served in the museum.

PUBLIC LECTURES DURING JUNE

June 2. "Economic Uses and Possibilities of Seaweeds" Dr. M. A. Howe
June 3. "Evolution" . . . . . Dr. C. S. Gager
June 9. "Insects and Insect Fungi" . . Dr. F. J. Seaver
June 10. Nature Talks—IV. "Ferns" . . Dr. W. A. Murrill
June 16. "Summer Wild Flowers" . . . . . Mr. C. W. Johnson
June 17. "Roses" . . . . . Mr. Robert Pyle
June 23. "The Big Trees of California" . . Dr. H. A. Gleason

June 24. "The History and Sources of Quinine'
Dr. H. H. Rusby
June 30. "Flowers of the Four Seasons" Mr. K. R. Boynton

CONFERENCE NOTES FOR APRIL

The staff and students of the Garden held the last monthly conference of the spring on Wednesday, April 4. The program consisted of papers on "Early Stages in the Formation of Crown Gall" by Dr. Mel. T. Cook, and on "The Annonaceae of the Beni River Valley" by Dr. H. H. Rusby.

Dr. Cook said that galls or tumors of various kinds are caused by insects, fungi, slime molds and bacteria. They have been the subject of extensive studies in Europe; but very little attention has been given to them in America until recent years. The studies under consideration at this time were undertaken to determine the early stages of the crown gall (caused by *B. tumefaciens*) on castor bean seedlings. The galls originate in cortex or pith parenchyma. The tissues of the fibro-vascular bundles may be distorted but the tissues have undergone too much differentiation to be affected otherwise. The tumor strands may appear in either cortex or pith parenchyma. Those in the former are between the fibro-vascular bundles.

Dr. Rusby will publish an account of the Annonaceae in a later issue of the Journal.

HESTER M. RUSK,
Secretary of the Conference.

NOTES, NEWS AND COMMENT

The Annual Meeting and May Flower Show of the Horticultural Society of New York was held at the museum building of the New York Botanical Garden on May 11–13. Numerous prizes were awarded to professionals and amateurs for exhibits of both cut flowers and plants. An especially beautiful feature of the show was the wonderful display of Calceolarias—beautiful conservatory plants with flowers shaped like a bag or a shoe according to the interpretor's imagination, in beautiful velvety colors of yellow, brown and purple.

The Mansion of The New York Botanical Garden caught fire on the morning of March 26, resulting in the complete destruction of the roof and the two upper floors and in considerable damage to the main and second floors. The fire began on the roof near the chimney, and is supposed to have originated from sparks catching on the shingles. Several employees of the Garden were in the Mansion at the time, including Mr. A. J. Corbett, Superintendent of Buildings and Grounds. He promptly took measures toward the protection of the property in the building until the arrival of the fire patrol, through whose efficient work in covering the contents of the lower floors and thereby protecting them from water the damage to the furniture and the important collections of the Bronx Society of Arts, Science and History was kept comparatively low. Three engines responded to the alarm and were able to confine the fire to the upper floors of the building.

Dr. Murrill was awarded a gold medal by the Holland Society of New York at its annual meeting at the Hotel Astor on March 6, in recognition of his distinguished service in the science of Mycology. After the presentation, he gave an illustrated address on "Fungi and Their Relation to Forestry in America."

Meteorology for March. The total precipitation for the month was 3.31 inches, of which 0.60 inch (6 inches by snow measurement) fell as snow. The maximum temperatures recorded for each week were 50° on the 11th, 56° on the 16th, *77° on the 23rd* and 50° on the 27th. The minimum temperatures were 15° on on the 9th, 20° on the 15th, 14° on the 20th and *11° on the 29th*.

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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIV June, 1923 No. 282

JOURNAL

OF

The New York Botanical Garden

EDITOR

H. A. GLEASON

Assistant Director

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

Vol. XXIV June, 1923 No. 282

THE NEEDLE PALM—RHAPIDOPHYLLUM HYSTRIX

If one should thrust his hand close to the stem of this palm he would promptly understand why the name needle-palm was applied to this plant. Numerous long, slender, needle-like structures constitute an important part of the leaf-sheath by being woven together by coarse pliable fibers.

Botanically, this palm, which is quite unique in our flora, is only a little over a century old. However, the needle-palm is suggestive of a very ancient type of vegetation. Besides its very specialized leaf-sheath, its flowers are dioecious; that is, the staminate flowers and the pistillate flowers are borne on different plants.

From the standpoint of plant geography, the needle-palm is particularly instructive. Most of our native palms are related to tropical American species or are identical with them. In some cases their ancestors may have migrated from the West Indies to Florida. It is different in the case of the needle-palm, for its relatives are now on the o›posite side of the globe, or, in other words, they inhabit southeastern Asia. The primitive history of this plant is, of course, wholly lost. We are safe in believing that its geographic range was more extensive in later geologic times than at present. It is now restricted to a limited area in and near the southeastern Coastal Plain. It probably originated in or migrated to southeastern North America at the same time that the other types of plants that are common to eastern North America and to eastern Asia flourished—*Tumion*, *Croomia*, *Hugeria*. At all events, its ancestry is lost in geologic time.

As in the cases of some of our other Asiatic plant-relatives, this palm may have inhabited the highlands, perhaps both the

In the swamp of Little River, Gadsden Co., Fla.—The needle-palm (*Rhapidophyllum Hystrix*) grows in rich alluvium in the hammock where the cow-oak (*Quercus Michauxii*), the dominant tree, contributes generously to the supply of humus in the soil by its very numerous thick leaves. In this soil the needle-palm and the blue-stem (*Sabal minor*) thrive luxuriantly. The plants are much more foliose than those of the blue-stem, and the leaf-segments are more numerous.

high and the low country, or may be only the more elevated parts. If this condition existed before the glacial times, the rigors of that period either exterminated the species in the highlands, sparing those in the lowlands, or some representatives retreating to the lowlands took shelter in protected places and maintained a representation of the species to the present.

As a species the needle-palm does not suggest vigor or aggressiveness. It is, doubtless, one of those plants which is on the verge of becoming extinct through natural agencies. Of course, this era of extinction means a long period of time, but were it not that the plant usually grows in the kind of place less frequently disturbed by man in his methods of civilization, the time would be much shortened by artificial agencies. Supposing the palm really inhabited the higher lands to the northward of its present geographic area, it now does not show any inclination to reestablish itself in its former domain.

Recent field studies have brought to light some very interesting facts in the life history of this palm, and disclosed the reasons for its non-aggressiveness. For some reason the inflorescence, both staminate and pistillate, is much contracted or congested; even the spadix is short and the flower clusters borne close to the spadix are hidden in the mass of needles and wool-like fibers, together with more or less accumulated foreign matter, in the crown of leaves. The inflorescence never protrudes, not even in fruit, as it does in our other palms. So exaggerated is this contraction of the inflorescence, that the whole cluster of fruit remains in the crown until they either decay or sprout, if enough humus and moisture accompany the cluster. If the fruits do sprout, the seedlings rarely survive, for they usually have insufficient material to support growth. We have found clusters of fruits, mostly decayed, that have lain in the crown of leaves for at least two years. Under favorable circumstances the seeds sprout *in situ*. We have found clusters of two dozen young seedlings standing in the crown of leaves, few, if any, of them, however, with the slightest chance of growing to maturity. Apparently the only agency for distributing the seeds is that of animals seeking the fruits as food, but the chances for distribution by this method are limited on account of the armament which bristles about the fruit-cluster.

In the fern grottoes of Citrus Co., Fla.—A plant of the needle-palm perched on a fern-covered limestone rock. It grows there in almost pure humus which coats the rock. The plants are smaller and the leaf-segments fewer than in the case of plants in the preceding illustration, a result, perhaps, of the fewer nutrient elements in the soil. In these grottoes the palm grows in the high places instead of in the low.

"Chamaerops hystrix is found along with the preceding [Sabal Adansonii]—which it resembles closely, with the exception of its singular spines. It was discovered by the late Mr. John Fraser, about sixteen years ago, near the city of Savannah."[6]

In 1817, Stephen Elliott[7] printed the following note in his sketch of the Botany of South Carolina and Georgia:

"This palm was first noticed by the late Mr. Fraser.[8] The leaves or fronds attain the heights of four to five feet. It is remarkable for the thorns, like porcupine quills, which grow from the root, intermingled with the fronds. It is found in rich, clayey soils, along the margins of swamps, and from its peculiar deep green color is sometimes called "Blue Palmetto."[9]

In the following year Thomas Nuttall,[10] having observed the plant, published a note concerning it as follows, at the same time transferring it to the genus *Sabal*.

in 1807. From 1812 to 1818, he was a surgeon in the United States navy, most of the time stationed in Georgia or Florida. Appointed surgeon and botanist to Long's expedition up the Missouri, he died at Franklin, Missouri, 1 September 1819.—J. H. B.

[6] Reliquiae Baldwinianae 344. 1843. (Written in 1816.)

[7] Stephen Elliott was born 11 November 1771, at Beaufort, South Carolina. He was a graduate of Yale College (1791), and prominent in the history of South Carolina as representative and senator in the State Legislature and as president of the State Bank for nearly twenty years. He was the author of the remarkable work modestly entitled by him a "sketch" of the botany of South Carolina and Georgia, although it filled two thick volumes and is a treasury of detailed original observations. He died at Charleston, 28 March 1830. His herbarium is now in the custody of the Charleston Museum.—J. H. B.

[8] John Fraser was born in 1750, at Tomnacloich, Invernesshire, Scotland. About 1770 he settled in London, engaging in business at Chelsea. He was for years one of the most famous European collectors of American seeds and living plants, in Newfoundland during the Revolution, and in the southern United States and Cuba after its close, crossing the Atlantic repeatedly in his quest between 1780 and 1810 He made the acquaintance of most if not all of the few American botanists of that day, and was responsible for the publication of Walter's "Flora caroliniana." It is believed that some of the plants described in the flora were collected by Fraser in regions never visited by Walter. Fraser's son, of the same name, accompanied him in his travels from 1799 to 1810, and continued the botanical exploration of the south-eastern states after his father's death, which occurred at Chelsea, 26 April 1811. -J. H. B.

[9] Bot. S. C. & Ga. 1:431. 1817.

[10] Thomas Nuttall was born 5 January 1786, at Long Preston, near Settle, Yorkshire. He became a journeyman printer, and early acquired a taste for

"The fronds indistinguishable from those of the preceding species [Sabal Adansonii] by any other character than the appearance of long axillary spines; the inflorescence has not yet been compared; its rare occurrence amidst so much of S. Adansonii leads to a suspicion of its validity as a distinct species. In the vicinity of Savannah pointed out to me by the kindness of Dr. Baldwin."[11]

Several years later Thomas Nuttall, in publishing some notes referring to plants collected by Nathaniel Ware[12] said[13]: "In this species, whose fronds resemble the preceding [Sabal Adansonii], the stipe is naked and triangular, not simply convex beneath; in the basalar axils of which a matted tomentose substance, almost similar to coarse brown wool, and intermixed with spines half a foot long, and rigid as needles, within these radical sheaths is enclosed the clandestine spadix loaded with hirsute brownish drupes, the size of coffee berries, and recent possessing an eatable sweetish pulp, with which the Aborigines are acquainted."

Carl Friedrich von Martius,[14] in his classic work on palms, after fully describing the plant, says: "Grows in Georgia, near

botany. During thirty-three years of residence in the United States, from 1808 to 1841, he devoted most of his time to botanical study, collecting plants not only in the northeastern states, but in the middle west, the south, across the Rockies, and on the Pacific coast, and in Hawaii, and publishing his remarkable little work on the "Genera of North American plants," as well as numerous important contributions to botanical literature. He also became well known as an ornithologist. In 1841 he returned to England, and made his home at "Nutgrove," a small estate near Rainhill, Prescott, Lancastershire, where he died 10 September 1859.—J. H. B.

[11] Thomas Nuttall, Genera 1: 230. 1818.

[12] Nathaniel A. Ware, who was born about 1780, is said to have been a native of Massachusetts, but most of his life was spent in the southern states. He studied and practiced law in South Carolina, but settled at Natchez, Mississippi, in territorial days (before 1817), and there amassed a considerable fortune. In later years he lived at Philadelphia and Cincinnati, and he died at Galveston in 1854. His interest in the natural sciences was well known; Nuttall described many new species of plants collected by him in East Florida and West Florida, and dedicated to him the cruciferous genus *Warea*.—J. H. B.

[13] American Journal of Science 5: 293. 1822.

[14] Carl Friedrich Philipp von Martius was born 17 April 1794, at Erlangen, Germany. His father, Ernst Wilhelm Martius, who died in 1849 at the age of 93, was an apothecary of Erlangen, and had been one of the founders of the famous botanical society of Ratisbon (Regensburg) in 1790. From association with his father and his father's friends, he very early acquired a good know-

Savannah, and in other places, more frequent in Eastern Florida, Fraser, Bartram, Pursh, Nuttall, Ware. Called by the inhabitants, creeping palmetto."[15]

Nearly forty years more passed by during which this palm, when referred to, still appeared under the generic name *Chamaerops*.

However, in 1876, two students of the palms, Hermann Wendland[16] and Oscar Drude[17] properly interpreted it. Heretofore this very characteristic palm had masqueraded under at least four

ledge of botany, and immediately after securing his degree as doctor of medicine, in 1814, removed to Munich and began to assist in the work of the botanic garden of that city which was his home for the remainder of his life. From 1817 to 1820 he was in Brazil, as the botanist of a Bavarian expedition, collecting plants and studying the flora not only near the coast but up the Amazon as far as the Peruvian boundary. It was this journey that determined his life-work, and resulted in the publication of volume after volume, written or edited by him, upon the flora of Brazil. The *Flora brasiliensis* (1840–1906), a great folio work established by him and lovingly edited by him until his death, is the most monumental work devoted to the flora of any country. It was during his Brazilian travels, too, that his interest was aroused in the poorly-understood family of the palms. In 1823 he began the publication of a magnificent folio work upon the palms of Brazil; the scope of the work expanded as it progressed, until, upon the completion of its three volumes in 1850, it constituted a monograph of the known palms of the entire world. His publications, however, extended not only into other botanical fields, but into the realm of Brazilian ethnology and linguistics. He became professor in the university at Munich in 1826, and director of the botanic garden there upon the retirement of Schrank in 1832, retaining both of these positions until his own retirement in 1854. He died at Munich, 13 December 1868.—J. H. B.

[15] C. F. von Martius, Historia naturalis Palmarum **3**: 251. 1839.

[16] Hermann Wendland was born 11 October 1825, at Herrenhausen, Hannover, where his father was director of the royal garden. He studied botany and horticulture at various gardens in Germany, Austria, and England, became his father's assistant in 1850, and succeeded him as director of the Herrenhausen garden in 1869. During most of his fifty-two years at this institution he devoted particular attention to the study of palms, upon which he became the leading authority. He died at Herrenhausen, 12 January 1903.—J. H. B.

[17] Carl Georg Oscar Drude was born 5 June 1852, at Brunswick, Germany. He studied the natural sciences in his native city and at the University of Göttingen, where he specialized in botany and received his doctor's degree in 1874. Since 1879 he has been professor in the technical school at Dresden. For fifty years he has been contributing to the literature of botany, his writings covering diverse fields of the science: taxonomy, phytogeography, and physiology. The palms have been a favorite subject of study with him ever since his early days at Göttingen.—J. H. B.

generic names, *Chamaerops*, *Corypha*, *Sabal*, *Rhapis*. Seeing that it belonged to none of these on account of its different morphological characteristics in the leaves and inflorescence, Wendland and Drude named it *Rhapidophyllum*, a name referring to the needle-like structure in the leaf-sheath.[18]

The needle-palm ranges naturally from South Carolina to central Florida and Alabama, and is, perhaps, in Mississippi. It grows mainly in low sandy woods and swamps, particularly in river swamps. It also occurs in the limestone fern grottoes of northern peninsular Florida, where it may be found in the low depressions, or seated on top of the highest rock outcrops where the plants are much reduced in size. However, it is in the alluvium of the swampy flood plains of rivers that the palm reaches its maximum development and best proportions. There it proves itself to be the most graceful and beautiful of our stemless native palms.

Its armament is such a conspicuous character that the plant has often been called the "vegetable porcupine."

JOHN K. SMALL.

HARDY FERNS

Along terraced slopes and among rocky crevices to the east and north of a huge mass of native rock lies the fern garden. Natural conditions have been imitated by a miniature brook which has been caused to flow down from the summit in cascades and pools; and sheltering trees protect these delicate plants in the heat of the summer.

The fern garden may be reached by the Horticultural Grounds entrance, passing north by the Rock garden or from the 200th treet entrance, going south through the Herbaceous grounds.

Ferns are not showy plants, and hide their individuality beneath a superficial sameness; but like all unobtrusive objects, they are wonderfully fascinating when their small differences, seemingly so unimportant, are studied and appreciated. Among some groups of the flowering plants there exist separate

[18] Botanische Zeitung **34**: 803. 1876.

popular names for almost every botanical species; whereas among the flowerless plants whole genera and orders are comprehended under a single name—it is a seaweed, a sedge, a moss or a fern—and the mind is satisfied. But let the quiet charms of a hardy fern garden engage our thoughts for a while and we shall see if there is not an interest there unsuspected before. It is always interesting to see how an amateur grows enthusiastic when interest is aroused and he really becomes acquainted. The shapes of the leaves, superficially so similar among ferns, and most of all the structure and position of the small spore-bearing bodies upon them, show that remarkable persistence of type by which it is possible to separate the ferns into families, genera and species as unmistakably as in the case of the higher plants.

The European peasants of the Middle Ages, who wove a rich fabric of folk-lore about each familiar object of field and greenwood, noticed with their native keenness of perception that ferns, unlike other plants, are without flowers, and hence have no fruit or seed. Thus they reasoned, with the typical logic of folk-lore, that since ferns obviously multiply, they must have invisible seeds, which if they could be collected, would bestow the interesting quality of invisibility. The royal fern (*Osmunda*) according to a German folk tale, bore seed on St. John's Eve; and that painstaking herbalist Hieronymus Bock (1498–1554) actually went out to see, spending four nights in the forest and finding "small black seed like poppy seed" and assures us that he used "neither charm, incantation, nor magic character."

In his English "Herball," printed in 1597, John Gerard distinguished twenty-three kinds of ferns. The variously shaped spore-bearing bodies on the underside of the leaves did not escape his keen attention, and he described them faithfully though he was quite unaware of their function. Of the "Osmund roiall" (*Osmunda regalis*) he wrote: ". . . the browne rough and round graines that grewe on the top of the branches, which yet are not the seeds thereof, but yet are verie like unto the seede." Writing of a certain *Asplenium:* "This kinde of Spleenwort is not only barren of stalks and seede, but also of those spots and markes wherewith the others were spotted:". Telling of *Dryopteris Filix-mas*, he mentioned the ". . . verie fine earthie coloured dust or spots, which many rashly have taken for seede:". Of

course modern botanists do not speak of these spore cases nor the spores they contain, by the term seed; but that is an arbitrary point, and we may be sure Gerard would have called them seed if he had known that they were the means by which new plants were produced. Though he did not know their economy, see how minutely he describes the arrangement of these bodies —probably with but the unaided eye—in the case of the "Polypodie of the Oke": "This kinde of Ferne, called Dryopteris . . . the Leaus being sprinkled, not with russet or browne marks or specks, as the other Fernes are, but as it were painted with white spots or marks, notwithstanding out of the leaves in scales, as the spots of the male Ferne which are double upon eache leafe, [but] close unto the middle rib or sinew." Again he shows a sense of the classificatory value of the arrangement of the spore-cases when he says: "This plant which we have inserted among the Adianthes as a kinde thereof, may without error so pass . . . underneath, set with little fine spots, which evidently showeth it to be a kinde of Ferne."

It was not till the later development of plant science that the real function of these spots and marks became clear. The visible portion is ordinarily merely a covering for, or a group of, numerous spore-bearing cases which in turn contain many spores. Falling upon suitable soil under moist conditions, each spore may form a tiny green structure, upon which the essential processes take place, and from which the roots descend and the leaves arise of the fern plant that we know. Many species of ferns propagate themselves vegetatively also, by runners, rhizomes, or by rooting from leaf-tips. One who carefully establishes a fern garden under conditions as nearly as possible resembling those in which the ferns grow in nature may confidently expect a considerable increase from all of these methods of reproduction.

Ferns are pure ornaments. None of them have any economic value, save in a very limited and local way. In Germany and Central Europe the leaves were used as any litter might be to provide bedding for cattle, and it is said that the German name for the group—"farn" from which "fern" is derived—alludes to this use. Medicinally also they are of little merit. Even the herbalist, who considered every plant upon the assumption that it *must* have some virtue if only it could be discovered,

had little to say about any fern except the spleenwort. Even then Gerard put the responsibility upon an older authority, quoting: "'Dioscorides teacheth that the leaves boiled in wine and drunke by the space of fortie daies, doth take away infirmities of the Spleene.'"

The ornamental use of plants has developed so much in recent decades that we are apt to forget the rather utilitarian attitude of these old worthies the herbalists who after all took such a lively interest in plants more for their "virtues" than for their charms. We can thus readily understand why, in the "Grete Herball" printed in 1526, the lovely maidenhair fern is passed by with the highly enlightening information that "Capillus veneris is an herbe so named."

The popular names of some ferns are not without a quaint interest. Brake or bracken is the common name for *Pteridium aquilinum*, one of the largest ferns found in the northern parts of both the Old and New World. In several Teutonic languages it bears similar common names, all referring to its place of growth in open field which admit of being "broken" or plowed for agriculture, rather than in deep woods with the other ferns. There has been quite a little discussion over the meanings of the names "oak fern" and "beech fern." Some imagine that their leaves resemble those of the oak or the beech, and others have tried to prove that they are more frequently found growing beneath the trees to which they are dedicated; but the most likely explanation is that the names arose from a belief expressed by the herbalists that such of these ferns as were found growing above the roots of oak and beech had unusual medicinal properties. Plants were first noted not to exemplify biology, but for their practical value, though this was so often based on superstition. Two other obscure names have come down from the herbalists to the present day. "Male fern" and "female fern" are names which refer to a medieval idea of gender, more Continental than English, and not to any notions of sex as we understand it. Formerly these adjectives modified numerous other plant names.

The shield-fern (*Dryopteris* of present-day botanists) takes its name from the shape of the covering of the spore-cases. The royal-fern (*Osmunda regalis*) has a history woven with mythology of the northern countries. Some refer it to a Scandinavian deity

Osmunder, but are unable to show more than an apparent connection. Gerard says that the name refers to something in the hard woody rootstock resembling the heart of a mythological character—Osmund, the waterman. The grape fern takes both its English and its Latin name (*Botrychium*) from the appearance of its fertile fronds resembling clusters of grapes. The evergreen Christmas fern is often gathered for decoration at the holiday season. Shipping them to the city florists has become quite an industry. The sensitive fern (*Onoclea sensibilis*) is very well named, for it is the first fern to show the effect of an early frost.

In the fern garden with its numerous rocky crevices and pockets, its terraces and miniature swamps, and its limestone and bog soils, all brought together in one landscape composition, each of the separate species of ferns finds a congenial home.

This large collection of hardy ferns was brought together during a number of years by the efforts of several persons. The earlier collections were made by Miss Margaret Slosson and Dr. Ralph Benedict. Dr. C. A. Weatherby and Dr. Walter Mendelson did much to increase the completeness of the representation and Dr. Southwick has given a great amount of time and effort to bring the collection to its present state. The collection contains many individuals of about twenty-five native American species and three exotic introductions. The list below shows them arranged according to the environment in which they are growing.

Bog:

Anchistea virginica (Virginia chain-fern)

Moist woodland terraces, etc.:

Dryopteris noveboracensis (New York fern)
D. Thelypteris (marsh shield fern, fragrant meadow fern)
D. cristata (crested shield fern)
D. Clintoniana (Clinton's fern)
D. Goldieana (Goldie's fern)
D. spinulosa (spinulose fern, common wood-fern)
D. dilatata (spreading shield fern)
D. Boottii (Boott's shield fern)
Matteuccia Struthiopteris (ostrich-fern)
Athyrium thelypteroides (silvery spleenwort)
A. Filix-foemina (lady-fern)

Osmunda regalis (royal fern)
O. cinnamonea (cinnamon fern)
O. Claytoniana (Clayton's fern)
Onoclea sensibilis (sensitive fern)

Secondary rocky terraces:

Polystichum acrostichoides (Christmas fern)
P Braunii (Braun's holly fern)
Dryopteris marginalis (evergreen wood fern)
D. Filix-mas (male fern)
Polypodium vulgare (common polypody)
Lygodium palmatum (climbing fern or Hartford fern)
Botrychium obliquum (ternate grape-fern)
B. dissectum (cut-leaved grape fern)
Filix fragilis (brittle fern)

Rock crevices filled with prepared limestone:

Asplenium Trichomanes (maiden-hair spleenwort)
A. ebenoides (Scott's spleenwort)
A. Ruta-muraria (wall-rue spleenwort)
A. platyneuron (ebony spleenwort)
A. pycnocarpon (narrow-leaved spleenwort)
Cryptogramma Stelleri (slender cliff-brake)
Pellaea atropurpurea (purple cliff-brake)

Rocks:

Woodsia ilvensis (rusty woodsia, flower-cup fern)

Rocks along watercourse:

Dryopteris Phegopteris (beech-fern)

Exotic forms:

Dryopteris chrysoloba (golden-lobed shield fern from Brazil)
Asplenium Goeringianum pictum (painted spleenwort)
A. viridescens (Japanese spleenwort).

JAMES A. CRAWFORD.

PUBLIC LECTURES DURING JULY

July 1. Nature Talks—V. "Mushrooms." Dr. W. A. Murrill.
July 7. "Plant Traps." Dr. J. H. Barnhart.
July 8. "Some Great Men and Their Love of Trees." Mr. Carl Bannwart.

July 14. "Diatoms—Plants of Beauty Seen Through a Microscope." Dr. M. A. Howe.
July 15. "A Garden Pilgrimage in England." Mr. Montague Free.
July 21. "Collecting Fungi in Porto Rico." Dr. F. J. Seaver.
July 22. Nature Talks—VI. "Punk-fungi." Dr. W. A. Murrill.
July 28. "Fifty Trees in the Botanical Garden." Mr. K. R. Boynton.
July 29. "Evergreens: What to Plant and Where to Plant Them." Mr. Arthur Herrington.

NOTES, NEWS AND COMMENT

In pursuance of the Stokes' work for the preservation of our native plants, Mrs. Britton has visited six clubs in the vicinity of New York, giving informal talks to the Englewood, New Jersey, and Fairfield, Connecticut, Garden Clubs, illustrated by posters and literature, and three lectures to large numbers of school children at New Rochelle, under the auspices of the Conservation League, and at Plainfield for the Garden Club and at Summit for the Nature League and Garden Club, with a visit to New Canaan, Connecticut, where she lectured in the morning to the children of the Public Schools and to the Garden Club in the afternoon.

Dr. Mel. T. Cook has accepted an appointment as Expert on Diseases of Sugar-cane at the Insular Experiment Station at Rio Piedras, Porto Rico. Dr. Cook was Plant Pathologist for the Cuban Government from 1904 to 1906, and since then has received many calls to return to the tropics; but on account of a desire to educate his children in the States, has always declined. He expects to sail some time toward the end of June.

Dr. John K. Small returned from Florida May 16 after several weeks devoted to field study and exploration in the peninsula and in the Florida Keys. Special attention was devoted to the palms and to the cacti, as well as to the collection of living plants and herbarium specimens, among which several new types were discovered.

About thirty-five members of the Garden Club of Stamford, Connecticut, spent Tuesday, May 22, at the Garden studying poisonous plants, and inspecting the tulips, orchids, ferns, rock-garden, iris garden and hemlock grove. The visit closed about four o'clock with a lecture on the growing of dahlias and a demonstration of the most approved methods of planting them.

The Garden is broadcasting a series of lectures on gardening from Station W.E.A.F. in the American Telephone & Telegraph Building. These talks are given every Wednesday morning at eleven o'clock by Mr. K. R. Boynton, Dr. Howe and others.

A testimonial dinner was tendered to Dr. H. H. Rusby at the Hotel Pennsylvania on April 16 at which he was presented with the fourth Remington Honor medal.

Dr. Barnhart spent a few days in Washington during the latter part of May inspecting the library of the Bureau of Plant Industry.

Meteorology for April. The total precipitation for the month was 2.66 inches. The maximum temperature recorded for each week were 69° on the 4th, 58° on the 11th, *90° on the 21st* and 74° on the 26th. The minimum temperatures were *11.5° on the 1st*, 32° on the 2nd and on the 3rd, 28° on the 10th, 31° on the 18th and 37° on the 26th. Ice disappeared from the middle lake on the 3rd.

ACCESSIONS

Museum and Herbarium

16 specimens of grasses from Alaska. (By exchange with the United States Department of Agriculture.)

2 specimens of *Galinsoga parviflora* from Florida. (By exchange with Mr. Severin Rapp.)

3 specimens of flowering plants from Massachusetts. (Given by Dr. H. M. Denslow.)

913 specimens of flowering plants from British Guiana. (Collected by Mr. J. S. De la Cruz.)

997 specimens of ferns and flowering plants from Ecuador. (From the herbarium of Edouard Andre.)

1 photograph of *Heuchera Rugelii* from Alabama. (Given by Dr. R. M. Harper.)

9 specimens of New England hepaticae. (Given by Miss Annie Lorenz.)
5 specimens of *Liagora* from Madagascar. (By exchange with the Botanical Museum, Berlin.)
4 specimens of marine algae from Newfoundland and Baffin's Land. (Given by Mr. Fritz Johansen.)
2 specimens of fresh-water algae. (Given by Professor Titus Ulke.)
14 specimens of fresh-water algae and other aquatic plants from Mound, Louisiana. (Given by Bureau of Entomology, United States Department of Agriculture.)
5 specimens of marine algae from Oaxaca, Mexico. (By exchange with the United States National Herbarium.)
63 specimens of fungi from San Salvador and Guatemala. (Collected by Mr. Paul C. Standley.)
100 specimens "Kryptogamae exsiccatae" Century XXVI. For the Columbia University herbarium. (By exchange with the Natural History Museum, Vienna.)
45 specimens of ferns and flowering plants from New York. (By exchange with the State Museum, Albany, New York.)
1 specimen of *Trillium pusillum* from Arkansas. (Given by Professor J. T. Buchholz.)
5 specimens of fungi from Porto Rico. (By exchange with Professor F. S. Earle.)
1 photograph of *Gunnera mexicana*. (Given by Mr. T. S. Brandegee.)
1 specimen of *Lechea maritima* from Long Island, New York. (Given by Dr. Arthur Hollick.)
4 specimens of *Riccia*. (By exchange with the herbarium of Yale University.)
3 specimens of hepaticae from Alaska. (By exchange with the United States National Herbarium.)
2 specimens of *Cephaleuros* from Florida. (Given by Mr. G. F. Weber.)
1 specimen of *Euosmolejeunea clausa* from Cuba. (Given by Brother Hioram.)
5 specimens of marine algae from Atlantic City. (By exchange with the United States National Herbarium.)
2 specimens of *Nostoc flagelliforme* from Colorado and *Sphaerella lacustris* from British Columbia. (Given by Professor Ellsworth Bethel.)
850 specimens of flowering plants from Oregon. (Collected by Mr. Morton E. Peck.)
120 specimens of flowering plants from Mexico. (Collected by Mr. C. A. Purpus.)
28 specimens of ferns and flowering plants from the Crimea. (By exchange with the Botanical Garden, Nikita.)
1920 specimens of flowering plants from Mexico and Central America. (By exchange with the United States National Museum.)
1 specimen of petrified wood from Santa Rosa, California. (Given by Mr. W. F. Burns.)
2 specimens of *Sonchus* from Minnesota. (By exchange with Professor J. M. Holzinger.)
3 specimens of *Sphagnum* from Long Island, New York. (Collected by Dr. Arthur Hollick.)

1 specimen of *Dendrocalamus sikkimensis.* (Given by the Royal Botanic Gardens, Kew, England.)

222 specimens of flowering plants from the W. W. Eggleston collections of 1919. (By exchange with the United States National Herbarium.)

3 specimens, *Magnolia virginiana* and *Chamaecyparis thyoides* from Long Island, New York. (Collected by Dr. Arthur Hollick.)

Library from Feb. 1—April 23

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3. A copy of all handbooks published by the Garden.
4. A copy of all annual reports and bulletins.
5. A copy of the monthly Journal.
6. Privileges of the Board Room.

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Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

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I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....

Vol. XXIV July, 1923 No. 283

JOURNAL

OF

The New York Botanical Garden

EDITOR

H. A. GLEASON

Assistant Director

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

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JOURNAL
OF
The New York Botanical Garden

VOL. XXIV July, 1923 No. 283

SPRINGTIME IN FLORIDA

Springtime is supposed to come sometime in April or May in New York City but in Florida it arrives from two to four months earlier, depending upon whether the observer is in the northern or southern part of the state.

I left New York on the afternoon of March 3 for Jacksonville, intending to spend several weeks in various parts of Florida exploring the forests and jungles for rare fungi and other objects of interest. In a ride of about thirty hours, I passed from a region of ice and snow to a land of perpetual sunshine and flowers; a contrast which was particularly noticeable this season because of the unusual severity of the New York winter.

On awaking early Sunday morning, I looked out upon the scattered pine groves of North Carolina; and, by the time I was ready for breakfast, we had moved on into South Carolina, where I saw long-leaf pine, holly, honeysuckle, and live-oak, while fat geese waddled about and thin pigs hunted food in a nervous and greedy manner. Plum trees were in bloom and I saw one beautiful bed of narcissus in flower. It was a land of cotton and turpentine and quantities of mistletoe. The most abundant ornamental tree seen in the yards, both in the Carolinas and in Georgia, was the umbrella-tree; which grows quickly, makes a dense shade, and is covered during the winter with berries.

The first Spanish, or Florida, "moss," was noticed in the swamps along the Great Pee Dee River, about half an hour after entering South Carolina. This plant, as is well known, is not a moss at all but bears flowers and belongs to the Pineapple Family, most of the members of which are air-plants. It injures trees by keeping out the light and air, but is useful for the manufacture of mattresses, cushions, etc.

About noon, ten miles north of Lanes, I saw the first dwarf palmetto palms growing wild; although at Florence I had seen one planted out in a yard. Farther south, this little fan-palm is extremely abundant, and it rattles like a giant rattlesnake when one walks through patches of it.

The most picturesque view I had during my entire journey was at the Santee River, a region well known to every American mycologist because of the important collections of Ravenel. Here, in the extensive swamps caused by the backwater of the river, were great groves of live-oak, cypress, and red maple, with Florida moss and mistletoe in abundance. The water was the deepest clay-yellow imaginable and formed a background to the picture. The gray moss waved in giant festoons from the bare cypresses; the mistletoe vied with the oak leaves in greenness; and the buds of the maple were a most vivid scarlet, like the reddest coral.

The first cabbage palmetto palm was noticed about half an hour before reaching Charleston. The most interesting trees of this vicinity, however, were the old live-oaks planted in avenues approaching the fine old houses of former days and now covered with gray moss, which adds many years to their appearance. The trees seem to grow a little straighter, with less spreading effect, than the live-oaks in California.

One hears much of the turpentine groves of North Carolina. The first one I saw from the train was at six o'clock Sunday afternoon just below Walthourville, Georgia, before we reached the Altamaha River. The pine trunks were cut in a peculiar way, as may be seen in the museum of the Garden, and the resin ran down into little buckets fastened below.

Jacksonville was reached at bedtime and I remained there until the next morning, when I boarded the train for the west coast. Seated in a comfortable parlor car, I kept a sharp lookout from shortly after ten until dark, when I arrived at Brooksville. We traveled first in a southwesterly direction as far as Burnetts Lake, near the central line of the state, then turned southward to Leesburg, and westward to Croom, where the Brooksville shuttle train met us.

From Jacksonville to Burnetts Lake, the country is wild and barren with very few houses. Most of it is pine land with thickets of dwarf palmetto, a few cypress swamps, and a few

pecan orchards. Nearly all the pines I saw were "boxed," or cut in a special way for turpentine, which was there collected in clay pots and hauled to the boilers with mule-teams. Young negroes stood by the boilers with poles and lifted the pots out after the resin had been melted. It was stored and shipped in barrels, while the pots were taken back to the trees again and again until broken.

This land is burned over every spring for grazing and all the boxed trees are apt to be destroyed unless dug about to keep off the fire. The cattle are scrawny and flea-bitten specimens. The fires were raging in some places, while in others the new grass was as green as a field of young wheat. A slight breeze was shaking clouds of pollen from the pine trees, and waving the gray moss on the cypresses to and fro. Fine strawberries are raised about Lake Butler, and a small orange orchard was seen there, the first noticed on my journey. About thirty years ago, a big freeze killed most of the groves north of Ocala and rather discouraged the growers, who turned to truck-farming and other pursuits.

From Burnetts Lake southward to Gainesville, the country is high, rolling, dotted with lakes and farms, and very attractive. Nothing could be prettier than the town of Gainesville, where the state university is located, embowered as it is in tropical foliage and flowers of many kinds. We stopped twenty minutes there and I walked through several streets, admiring the homes with their azaleas, dogwoods, roses, and peach-trees in bloom; masses of ferns on the porches; Bougainvillea and other vines; camellias with red and white flowers;—and everywhere the mockingbirds. Old live-oaks with Spanish moss shaded and beautified the streets. Many of the buildings were old, but in good repair, and there was a general appearance of thrift.

South of Gainesville are groves of oaks, hammocks, or patches of hardwood trees, and plenty of water. This section ought to be very interesting to a botanist and is doubtless visited a great deal by the students at the university. Before reaching Rochelle, however, pines and cypresses appeared again, with only patches of oaks. Micanopy Junction, at the head of Orange Lake, is a real botanist's paradise, having cypress marshes, oak groves, pine land, and mixed woods in plenty. Along the west shore of Orange Lake are some good orange groves, but it is still rather

far north for absolute safety, and I noticed that many farmers were growing cabbage and lettuce, which they were busy boxing up for shipment. The young trees in a few new orange groves were half killed by the recent cold spell, when the thermometer stood at 34 degrees F. at Jacksonville. From Lowell to Martin, there are ridges of scrub oak and other hardwood trees, which should be attractive to the botanical collector.

Ocala is a business town, with lumber markets, packing houses, garages, and the humble homes of working people. Much lime is made from the soft coral limestone in the neighborhood. Between Ocala and Leesburg lies the beautiful Lake Weir almost surrounded by pines, but with some fine orange groves and cottages on the eastern shore near East Lake Station. The old oranges were mostly on the ground, while the fragrance of the blossoms in the air foretold another bountiful crop. From Fruitland Park and Leesburg southward, the real orange land with red subsoil begins and the grower need not be afraid of frost. At the comfortable town of Leesburg, I bought three juicy oranges from a little boy at the station for a nickel, and I could have had them for the asking if I had gone out to the orchards.

The rest of the journey, from Leesburg to Croom and Brooksville, was rather barren and uninteresting compared with what I had just been through. There were ridges covered with pines, ridges with oaks, lakes and swamps, and one or two scattered truck-gardens; but few signs of life or prosperity. A lonely flicker, a solitary red-headed woodpecker, a hawk watching for prey, and a few patient turkey buzzards on their tireless wings were about the only wild things I saw in motion.

On the morning of March 6, I hired a motor-car and drove to the great Brooksville hammock, where I spent the better part of the day alone in this vast, dense wilderness of trees and undergrowth. The fungi were my chief objective, but I was surrounded by interesting plants of all kinds and the spring season was just beginning. The hornbeam, hop hornbeam, sweet gum, and dogwood were all in flower and looked familiar. The live-oak and a white oak with leaves like our chestnut-oak were also blooming, but they do not grow in New York. Holly, magnolia, viburnum, cabbage palmetto, and dwarf palmetto grew as shrubs or small trees, over which clambered various vines, such as the

cat-brier, Virginia creeper, jessamine, and poison ivy. Many of the trees bore Spanish moss, orchids, and other air-plants. I heard squirrels barking and saw hickory-nuts they had eaten. A redbird called and I answered his cheerful whistle. Looking up about twenty feet in a tree, I saw a neat little vireo's nest made of woven fibers and snugly fastened in the fork of a limb. While I stood perfectly quiet, a whole flock of warblers passed me, eagerly hunting their breakfast among the shrubs and low trees. Their little heads were doubtless full of the long journey north, where they would build their nests and rear their young.

The forest floor was covered with small palms; several kinds of ferns, like the bracken, spleenwort, Christmas fern, and sensitive fern; our same northern peat-moss, silver-moss, and lace-moss; a few flowers; and a good many fungi, growing mostly on dead wood. Three specimens of the fawn-colored mushroom were found and two of the appendiculate Hypholoma, both of which are edible kinds. The commonest flower, except those on the trees and vines, was a blue skull-cap; and a little white flower (*Houstonia rotundifolia*) with four-parted corolla, reminding me of bluets, grew in abundance on sunny banks at the edge of the hammock.

The prettiest flower I saw was an Atamasco lily about six or eight inches high, with erect, white flowers and rose-tinted buds. It seemed to like the rich, damp soil in rather low places. The curious resurrection fern, a near relative of our polypody, was common on the trunks of trees. In dry weather, its scaly leaves curl up and rest until a shower causes them to spread out again.

On my way back to the hotel, I found a fine specimen of a tropical bracket-fungus (*Elfvingiella marmorata*) growing on the trunk of a living, but badly decayed, live-oak tree on the streets of Brooksville. This species is similar to one in the North which attacks the beech and birch, causing a serious heart-rot.

Late in the afternoon, I left for Tarpon Springs by way of Croom and arrived about nine o'clock at Tarpon Inn. During an early walk about the town next morning before breakfast, I saw and admired the well-paved streets, pretty homes, and beautiful lawns planted with various tropical trees, shrubs, and flowers. Palms and live-oaks were abundant, some of the latter bearing large round galls. The "orchid tree" (*Bauhinia*)

was covered with splendid rose-colored flowers shaped like those of an orchid or sweet pea. Mockingbirds were singing and beginning to build their nests.

Shortly after breakfast, Mr. and Mrs. George Inness came to the Inn and took me to their beautiful home on Orange Street, where I remained as their guest.

Fishing for sponges is one of the industries of Tarpon Springs. It is managed mostly by Greeks, who own a large mother schooner and about a hundred little fishing-boats, from which divers go down a hundred feet or more and bring up the sponges from the bottom. Some of these sponges are as large around as a barrel, and all of them are colonies of little animals which live around the horny, fibrous skeleton so much used for washing automobiles and the plants in conservatories. A brown sponge the size of one's two fists cost only 25 cents down there. The white sponges are bleached and cleansed with acid. I was shown about by Mr. G. Inness Hartley, a nephew of Mr. Inness, who was with Mr. Beebe for some time in South America and has recently published a book on "The Importance of Bird Life."

After seeing the sponges, he and I went on a long motor ride up the river to a camp built by Mr. Inness. We passed beautiful orange orchards, and went into a palmetto grove, where I found a large fungus (*Ganoderma sulcatum*) that I had named several years ago but had never seen growing. It occurs only on the cabbage palmetto, so far as I know, and doubtless causes the trunk to decay.

The next morning Mr. Hartley and I drove up the river to a palmetto grove and a cypress swamp where we collected a number of fungi, among them another species which I had named many years ago from Florida specimens found on live-oak. Beautiful blue lupine flowers were abundant along the highway; and the tunnels of the "salamander" were visible everywhere in the loose earth, appearing as little mounds of white sand resembling ant-hills. The Florida "salamander" is really a kind of gopher, or chipmunk, but the gopher in that country is a turtle, so another name had to be used. These little animals burrow through the loose, sandy soil much like a mole and come near the surface and throw up these mounds in their hunt for grass-roots, upon which they feed. They are

very rarely seen because of their subterranean and nocturnal habits.

Luncheon was served early, after which the family escorted me in their car southward along the new Memorial Highway to Tampa and onward at a goodly pace to Port Tampa, where the steamer was found ready to sail at two o'clock for Key West, a voyage of 255 miles.

Breakfast was eaten in Key West before any of the inhabitants were up and I caught the early train for Miami over the famous Flagler Extension, which, in itself, is worth traveling many miles to see. Passing from one Key to another and stopping at every house almost, I had a splendid opportunity to see the vegetation and bird life of the region in ease and comfort. Brown pelicans and great blue herons were abundant. Native species of Agave were seen in flower near the center of one of the keys, the tall, branched flower-stalks reaching fifteen or twenty feet in the air and being clearly outlined above the other vegetation.

Most of the keys, however, were wild, rough tangles of cacti and shrubby growths covering dry, coral rocks and fringed with thickets of mangrove and sea grape. Few habitations were seen and very few attempts had been made to cultivate this barren wilderness, which ought to be an excellent place to grow sisal. On Long Key, where we stopped for luncheon, there are attractive quarters for bathers and fishermen on the white beaches shaded by numerous cocoanut palms.

Islamorada has more houses than the Long Key resort and there are a few orchards adjoining the village, but the place is not so attractive. Shortly before one o'clock, the keys had been left behind and we were on the mainland, with the Everglades in sight. But there were still the same key formations to be seen rising like islands above the vast swampy stretches of cat-tails and bulrushes, and fringed with mangrove thickets.

At Florida City, I saw the first houses and cultivated fields on the mainland, with pines and lumber and business activity, which became very pronounced when we reached the thriving town of Homestead. This is the tip-end of Florida, corresponding to Bowling Green in Manhattan, and I saw nothing that could be termed "lazy";—everybody was doing something. Lumbering, trucking, and fruit-growing seemed to be the main industries, with box factories and canning establishments as strong rivals.

Instead of going on to Miami, I got off at Coconut Grove, five miles away, and visited Dr. David Fairchild, chief of the Plant Introduction Division of the United States Department of Agriculture, who makes his home there during a portion of the winter. He is now very busily engaged in developing the Chapman Aviation Field, a splendid area of 890 acres, which has been turned over to his division for experiments with foreign plants of possible economic value to us for food, medicine, clothing, ornament, etc.

The problems of soil, water, and climate are peculiar and difficult. Coral rock does not appear to the casual observer to be a very desirable substratum for farming, and many plants dislike such a large percentage of lime. It will take twenty-five years to accomplish anything of great importance, but a beginning is to be made at once. Fortunately, there are huge tanks and an ample supply of water already available, which were used by the aviators.

After looking over Chapman Field with Dr. Fairchild, we drove on to Cutler to see Mr. Charles Deering, who is doing so much to preserve the original Florida vegetation in the vicinity of Miami. He seemed particularly disturbed at the time about the possibility of fires in the hammocks owned by himself, his brother James, and other wealthy men having estates in southern Florida.

Fires were common all over the state during my visit. The pines, of course, can stand fire unless they are boxed for turpentine, but many of the other trees are either killed or badly damaged by repeated burning. The Caribbean pines of southern Florida are tall and picturesque, like the famous pines of Italy, and it is a great pity that they are so rapidly disappearing before the axe of the lumberman and homesteader.

Royal Palm hammock, one of the largest and finest hammocks in the state, is now a park controlled by the Federation of Women's Clubs, and a plan is under advisement by which it may be protected from fires through digging a canal entirely around it. I spent a day there collecting fungi, with the permission of Mr. Wheelock, who is in charge. The trails are very attractive, indeed, and a few of the important trees are labeled.

Mr. Deering not only arranged for me to visit Royal Palm hammock, but sent Mr. John DeWinkler with me to good col-

lecting grounds at Cutler, Snapper Creek, and elsewhere; while Dr. Fairchild and Mr. Wyatt also helped me with their cars. The result was that I got about all the fungi that were then in season in southern Florida, and a very good idea of the country and the general vegetation as well.

The highways are excellent, and often shaded with pines, palms, live-oaks, or Australian pines (*Casuarina*). In spite of the soil conditions, the homes of the wealthy are surrounded with all sorts of tropical vegetation and are as attractive as one could possibly desire. During the winter and spring, the climate is delightful, but most people desert their homes during the summer, when the humidity and the insects make life there quite unbearable.

My journey northward, after a busy and profitable week at Coconut Grove, was continued by train from Miami. From three o'clock in the afternoon until dark, I enjoyed the view from the car window, noting with interest the gradual change from the unique vegetation of the Everglade region to that of northern Florida, where the long-leaf pine and the dwarf palmetto are the dominant elements. North of Hollywood, we passed great fields of pineapples, which seemed to be almost the only crop cultivated in that region. South of Palm Beach, we skirted the western shore of Lake Worth, with its beautiful homes and prosperous farms, where the Dixie Highway was shaded with Australian pines and honeysuckle vines. If possible, one should select the site of his future home in Florida on or near a lake, where the soil is rich and moist.

Arriving at Fort Pierce at ten o'clock at night, I went out to find a hotel and to inquire about getting over to Okeechobee City the next morning to collect in the magnificent virgin forests of bald cypress at the head of Lake Okeechobee; but I learned that the roads were torn up and no vehicles were running. Seeing the train I had left still standing at the station, I returned with bag and baggage to my Pullman and found a vacant berth, which I at once occupied, leaving a call for New Smyrna.

Arriving there at daybreak, I looked about the town a little and finally located at the Alba Court Inn, which Dr. Macbride, the authority on American slime-molds, had left only the day before. He had been there several days and had visited the woodlands in the vicinity with my friend, Prof. H. C. Beardslee,

a winter resident of New Smyrna and a well-known authority on fungi in general. It took me only a couple of hours to get in touch with him, and we spent the forenoon in one of his favorite collecting grounds among the cabbage palmettos, red cedars, and live-oaks, finding a goodly number of interesting fungi.

One of our northern spring flowers, the little partridge berry (*Mitchella*), was in full flower in the woods, and we found a bitter orange tree loaded with ripe fruit. The coontie (*Zamia*) is grown rather commonly in the yards at New Smyrna for ornament, and I saw its leaves used on tables and in churches for decoration. This is the plant in which Webber discovered motile sperm cells, following the investigations of Ikeno on Cycas.

Daytona is not far from New Smyrna and the vegetation is very similar. Between the beautiful old town of St. Augustine and Jacksonville, I saw blue flags in bloom in the swamps and Cherokee roses and azaleas in the woods. St. Johns River, below Jacksonville, still has a little of the water hyacinth which obstructed navigation in years gone by because of its prolific growth.

At Charleston, South Carolina, I stopped to see the famous old museum, the first in the United States, and was shown about it and the town by Miss Laura Bragg, the director, who was busy preparing for the celebration of the 150th anniversary of the museum. We saw *Houstonia rotundifolia* in flower beneath an immense old live-oak in Magnolia Cemetery, which was covered with Florida moss and the resurrection fern (*Polypodium incanum*).

A forenoon was also spent at the celebrated Magnolia Garden, on the bank of the Ashley River, seventeen miles from Charlestown, where Mr. Drayton long ago brought together a wonderful collection of azaleas, camellias, and other interesting shrubs and trees, such as the live-oak, cypress, sycamore, umbrella-tree, magnolia, dogwood, golden-bell, bush honeysuckle, and holly. Many of these plants were in flower at the time of my visit and the garden was a perfect blaze of color. The following description of this southern paradise appeared in a Charlestown newspaper:

"Far up the Ashley, where the waters from the Atlantic only ebb and flow languorously, where either bank is lined for miles

with the greenest marsh grass, overhung by great moss-draped oaks, there is a garden spot so lovely it seems to have been dropped from a fairy tale. It is like the storied gardens, with beautifully kept walks, rustic bridges over placid waters, a canopy of silver-gray moss suspended from wide-spreading oaks, a carpet of green velvet shot with violets—and all around are walls of flowers. Here is a huge snow bank of white azaleas, and at its edge, dripping over against it like a blood-red fountain, another great mass of flowers; its neighbor, in turn, a shade paler, and further and further on more and more exquisite banks of blooms. Here and there a giant Camellia japonica tree raises its limbs, covered with smooth, dark green leaves and wax-like flowers—red, mottled and white. Another turn in the path and a beautiful rhododendron comes in view, and over against the cottage, near the middle of the gardens, is a blaze of golden banksias. There are dozens of walks and acres upon acres of flowers. The eyes are filled with color and grace, the senses caressed by the intoxicating perfume from millions of fragrant flower cups. It is a sight worth traveling many miles to see."

W. A. MURRILL.

CYCADS, LIVING AND EXTINCT

The cycads, one of the two groups of plants commonly known as sago palms,[1] constitute the family Cycadaceae, and they are represented in our living flora by nine recognized genera and between eighty and ninety described species and varieties. These genera and their geographic distribution are, respectively, as follows:

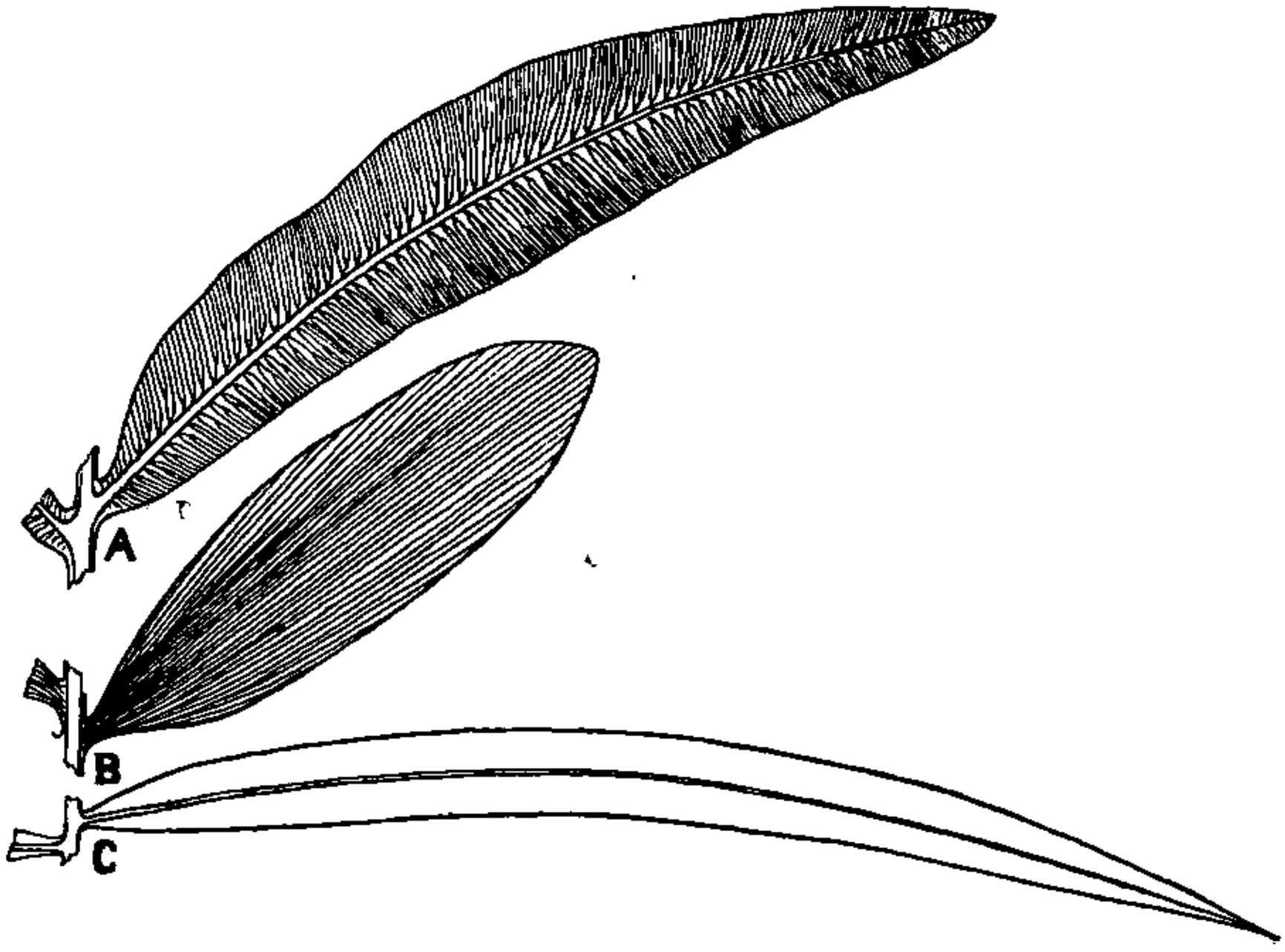
[1] The designation "sago palm" is commonly used in connection with two groups of plants that are, botanically, quite distinct from each other. One group is represented by the cycads, the other by certain species of fan palms. The cycads are gymnosperms, and their nearest relatives are the so-called evergreens—pines, cedars, spruces, etc. The fan palms are monocotyledonous angiosperms, in which class are included the lilies, grasses, sedges, etc. The designation "sago palm," therefore, is merely a commercial term which is applied indiscriminately to any plant, in either group, from which a starchy product is derived that is known under the trade name of "sago."

Cycas	16	species,	Australia, islands of the Indian and the Pacific Ocean, East India, Japan.
Macrozamia	14	"	Australia
Bowenia	1	"	Australia
Encephalartos	12	"	Africa
Stangeria	1	"	Africa
Zamia	30	"	South and Central America, West Indies, Florida.
Microcycas	1	"	Cuba.
Ceratozamia	6	"	Mexico.
Dioön	2	"	Mexico.

In connection with the foregoing tabulation it may be noted that the cycads are restricted in their geographical distribution to tropical and subtropical regions,[2] and that in the Old World the genus *Cycas* includes the largest number of species and has the most extended distribution, while in the New World the genus *Zamia* is the most prolific in species and is the one that is most widely distributed. Each of the other genera is more restricted in its distribution, four being confined either to areas of limited extent on certain continents, or exclusively to some one island. Of the latter, two (*Macrozamia* and *Bowenia*) are confined to Australia, and one (*Microcycas*) to Cuba, and the latter two are monotypic, that is each is represented by only a single species. The African genus *Stangeria* is also monotypic, and the Mexican genus *Dioön* includes but two species. From a consideration of these facts of geographic and biologic isolation it is evident that the four genera last mentioned represent types of vegetation that are on the verge of extinction. The three genera, *Macrozamia*, *Encephalartos*, and *Ceratozamia*, confined respectively to Australia, Africa, and Mexico, may be regarded as representing a biologic group that occupies a position intermediate between the monotypic and the more prolific genera.

[2] In the Old World the species that has the farthest northern distribution is *Cycas revoluta*, which grows in southern Japan at about 34° N. latitude. In the New World the species of *Dioön* in Mexico and *Zamia* in Florida represent those of highest northern range, at approximately 30° N. latitude. In other words cycads grow in Japan about 250 miles farther north than in North America, or at about the same latitude as Los Angeles, California, on the Pacific coast, and Columbia, South Carolina, on the Atlantic side of the continent.

In Conservatory Range No. 2 of The New York Botanical Garden a section is devoted exclusively to the cycads,[3] in which may be seen species representing all of the nine existing genera, with the exception of *Bowenia*. The salient features of the



EXPLANATION OF FIGURES

A. *Stangeria*. Pinnate type of nervation.
B. *Zamia* (also *Dioön*, etc.). Subparallel type of nervation.
C. *Cycas*. Nervation consisting of a single median nerve or midrib.
(All figures about two-fifths of the natural dimensions.)

plants are the thick, often cone-shaped trunks and the more or less fern-like leaves; and the species that shows both of these features in the most striking manner is *Stangeria eriopus*, of which there is a fine specimen at the western end of the section.[4] This species has leaves that are especially fern-like in appearance, by reason of the fact that, unlike all other species

[3] For a general description of the plants in this section reference may be made to an article by George V. Nash, entitled "The Cycad Collection," in the Journal of the Garden for October, 1909.

[4] For an extended description and illustration of this specimen, and the species in general, reference may be made to an article by George V. Nash, entitled "A Rare Cycad," in the Journal of the Garden for July, 1909.

of cycads, the nervation is pinnate, that is, consisting of a median nerve or midrib, with minor nerves or veins extending from the midrib to the margin, in a manner similar to that of most of the ferns with which we are familiar (Fig. A); and it is of interest to note that, based on the leaf characters alone, this species was originally described as a fern, was later regarded as a "fern-like *Zamia* or a *Zamia*-like fern," and subsequently, when specimens were found in fruit, was finally and definitely identified as a cycad. In all other genera of cycads (*Zamia*, *Dioön*, etc.) the leaves have parallel or subparallel nerves that extend from base to apex (Fig. B), or (in *Cycas*) only a single median nerve or midrib (Fig. C.).

The cycads, regarded as a group or natural family of plants, evidently represent a waning type of vegetation in the existing flora of the Earth. This is indicated not only by their relative unimportance in numbers, both as individuals and as species, and by the limited number of genera, three of which are monotypic, but also by the significant fact that in the past they existed in much greater numbers, in a much greater diversity of specific and generic forms, and were practically world-wide in their distribution.

About thirty-five genera, including about 280 species, based upon the fossil remains of either the trunks, the leaves, the fruits, or the flowers, have been described, and others are being constantly brought to light. They had their origin as a distinct type of vegetation far back in geologic time. Their immediate ancestors were the Paleozoic Cycadofilicales or cycad-ferns of the Devonian and Carboniferous periods, which represent an extinct order of plants that were, apparently, biologically intermediate between the cycads and the ferns. As was the case in connection with the living *Stangeria*, however, the actual relationship of the Cycadofilicales, as we now call them, with the cycads was not at first recognized, and they were regarded as true ferns by reason of the apparent mutual identity of the leaf characters. It was not until about the beginning of the present century that fossil cycadeoid seeds were first found actually attached to certain of the supposed fern leaves or fronds and the latter were found attached to stems or trunks of cycadeoid structure.

In early Mesozoic times, during the Triassic period, the cycad-ferns disappeared and were replaced by the true cycads—a type of vegetation that developed rapidly, flourished during the Triassic and throughout the Jurassic period, reached its climax, and then began to decline in the Cretaceous, contemporaneously with the first appearance of the higher angiosperm type of vegetation, represented by our common herbs and broad-leaved, deciduous shrubs and trees.

The cycads, during the period of their maximum development, were, apparently, the dominant type of vegetation; and this period, from the viewpoint of plant sequence and evolution, has been called the Age of Cycads. Their fossil remains have been found not only in the regions where they now exist, but also in the Arctic and Antarctic regions, as far as geological explorations have been prosecuted, indicating that mild climatic conditions apparently must have prevailed during the Triassic and Jurassic periods from pole to pole.

During the next succeeding period—the Cretaceous—they not only decreased in numbers and in relative importance as elements in the flora of the world, but they also became more restricted in their distribution. Climatic and physiographic changes resulted in their limitation or extinction in Arctic and Antarctic regions, and subsequently, in the Tertiary period, they had become exterminated in Europe, except in the southern part, and in North America were able to maintain their existence only in the Pacific coastal region, where milder conditions must have prevailed than elsewhere on the continent, as is the condition today. With the advent of the Ice Age they were exterminated throughout the arctic and temperate latitudes and their remnants were driven south into the subtropical and tropical regions where we now find them. There are now none native in Europe, and our only native representatives in the United States are four species of *Zamia* that occur in Florida. Incidentally, in this connection, it is of interest to note that the last known representative of the cycads that survived in Europe was a species of *Encephalartos*—a genus that is now found only in Africa, far to the south—and that apparently the last ones that survived in North America were species of *Dioön*, almost indistinguishable from the two remaining living species of the genus, now found only in Mexico.

Specimens of Carboniferous cycad-ferns, both leaves and seeds, are displayed in Cases Nos. 2 and 3 of the fossil plant collections and a number of specimens of Triassic and Jurassic cycads in Case No. 5; also, other specimens, in the study collections, are available for comparison.

ARTHUR HOLLICK.

THE IRIS GARDEN

Immediately after its organization in January, 1920, the American Iris Society began the development of a test and exhibition garden of iris and accepted the offer of The New York Botanical Garden to provide the necessary space and maintenance. As a result of the continued cooperative efforts of the two institutions, the collection of irises at the Botanical Garden now includes about 1050 named varieties, making a remarkably beautiful display during the flowering season and constituting probably the largest collection, in number of forms represented, ever brought together in one place in America.

The site selected for the iris garden is at the eastern end of the Horticultural Grounds, on the hillside just above the mallow collection. This site is not only much frequented by pedestrians, but is also in full view of an automobile drive at the foot of the hill. Its construction was begun in the spring of 1920 and a large number of varieties were planted during the following summer. Further additions were made during the summers of 1921 and 1922, and numerous accessions now being received will add still more varieties to this large collection during 1923.

Many of the varieties planted the first season flowered in 1921, while the season of 1922 showed a very prolific bloom. The annual meeting and exhibition of the American Iris Society was held at the Botanical Garden in 1922, and the iris collection was at that time studied and enjoyed by hundreds of iris enthusiasts. The spring of 1923 was both cold and dry, and the display of iris, while good, was not remarkable. This year, as before, the collection was visited daily during the blooming season by numerous students of the iris.

The value of such a complete collection is manifold. It provides for the enthusiast a living dictionary of iris varieties,

where he may study and compare them and observe for himself the quantity and quality of their flowers, their vegetative vigor, their adaptability to cultivation in the vicinity of New York, and their general desirability for a private garden. For the horticulturist and professional grower, it also gives opportunity to observe many rare or obscure varieties seldom offered in the trade, and numerous new seedlings, unnamed varieties, and recent importations. It has also served to reveal the presence of many synonyms among the trade names and to aid in the establishment of a uniform and stable nomenclature. For the casual visitor, the collection has provided a magnificent display of color and beauty and has helped to maintain and increase public interest in that part of the Botanical Garden reservation.

The cooperation by the American Iris Society has been hearty and continuous. Through the individual generosity of its members, it has provided all the plants, except a small nucleus from the original iris collection of the Botanical Garden, has given advice on maintenance, and has repeatedly checked over the names of varieties. The administration of the Botanical Garden desires to make public recognition of the valuable aid afforded by it in bringing the collection to its present development.

H. A. GLEASON.

THE ROSE COLLECTION

The collection of roses at The New York Botanical Garden was in unusually good condition during the month of June. It was inspected by members and friends of the Garden June 20, under the guidance of Mr. K. R. Boynton, Head Gardener.

The excellent appearance of the garden this year is due partly to a favorable preceding winter, but in greater measure to the addition of a large number of new plants, contributed by Messrs. Bobbink and Atkins, of Rutherford, New Jersey. Besides providing the plants, this company sent its own expert gardeners to superintend the shipping, delivery, and planting of the roses. In recognition of its generosity and interest, the Board of Managers of the New York Botanical Garden, at their meeting of June 21, adopted the following:

Resolved: that the Board of Managers cordially appreciate the cooperation of Bobbink & Atkins, of Rutherford, New Jersey, in the development of the collection of roses, by their generous contribution of over 2500 plants.

PUBLIC LECTURES DURING AUGUST

Aug. 4. "Gladioli." MR. K. R. BOYNTON

Aug. 5. Nature Talks VII. "Cycads and Pines.'
DR. W. A. MURRILL

Aug. 11. A Walk through the Hemlock Grove.
DR. W. A. MURRILL

Aug. 12. "Fall Work in the Flower, Rose, and Shrub Gardens."
PROF. H. FINDLAY

Aug. 18. "Trailing and Climbing Vines."
MR. K. R. BOYNTON

Aug. 19. "Practical Hints on Garden Design."
MISS E. L. LEE

Aug. 25. "Floral and Scenic Features of Jamaica."
DR. M. A. HOWE

Aug. 26. "The Vegetation of Montauk."
MR. NORMAN TAYLOR

NOTES, NEWS AND COMMENT

A class in botany at the Cold Spring Harbor Biological Laboratory visited the Botanical Garden on July 13, under the guidance of Prof. Norman M. Grier.

About seventy pupils from Mr. Max Schling's school of floriculture visited the Garden on the afternoon of June 29 and were shown through the two conservatory ranges, the rock garden, and the rose garden.

Dr. Ralph R. Stewart, professor of science in Gordon College, Rawalpindi, India, who was a student at the Botanical Garden, 1914–'16, is enjoying a year's leave of absence from his work, and was a visitor at the Garden on June 27.

About 400 girls from the Julia Richmond High School spent most of the day on June 1 at the Garden under guidance of

several teachers and a member of the Garden Staff. The Iris Garden was just at the height of its glory and appealed very strongly to the visitors.

Dr. H. A. Gleason, assistant director, left June 26 for Douglas Lake, Michigan, where he will spend two months at the Biological Station of the University of Michigan, continuing researches on the application of statistical methods to the study of plant association.

The Garden cooperated with the American Iris Society at their annual exhibition of irises, held in New Rochelle June 1 and 2. The display of irises was large and representative and attracted numerous visitors, many of whom also inspected the collection of iris at the Garden.

Dr. A. B. Stout, director of the laboratories, returned to the Garden June 25, after nine months at Pomona College, Claremont, California, where he was occupied with a study of fertility, sterility, and pollination in the date palm, the avocado, and the citrus fruits.

About 1,700 High School pupils in biology visited the Garden for definite work during Regents Week. They were taken about the grounds in groups of thirty or forty; shown through the conservatories and museum; and assembled in the large lecture hall for an illustrated lecture on "Forestry." Morris High School pupils came on June 18 and 19 and Evander Childs pupils on June 20. The lecture was given by Mr. Inman for Morris and by Mr. Hastings for Evander Childs. Members of the Garden Staff and teachers from the two schools acted as guides and instructors.

Among the visitors who enrolled in the library during the spring were the following botanists: Dr. Neil E. Stevens, Dr. J. N. Rose, Messrs. L. J. Schwarz and W. W. Eggleston, Washington, D. C.; Prof. L. H. Bailey and Mr. R. S. Kirby, Ithaca, N. Y.; Prof. Geo. H. Shull, Princeton, N. J.; Prof. L. J. Pessin, Baltimore, Md.; Mr. C. H. Connors, New Brunswick, N. J.; Prof. Samuel J. Record, Yale University; Prof. F. H. Blodgett, Danbury, Conn.; Prof. W. C. Coker, Chapel Hill, N. C.; Mr. Albert E. Vinton, Rockland, Mass.; Prof. W. A. Setchell, Berkeley, Calif.; Dr. L. O. Kunkel, Honolulu, T. H.; Rev. A.

B. Hervey, Bermuda; Miss Margaret S. Brown, Halifax, N. S.; and Prof. Francis J. Lewis, Edmonton, Alberta.

Meteorology for May. The total precipitation for the month was 2.03 inches. The maximum temperatures recorded for each week were 79° on the 4th, 77° on the 12th, 77° on the 18th and *89° on the 26th.* The minimum temperatures were 40° on the 2nd, *34° on the 11th*, 44° on the 15th and 41° on the 24th.

Meteorology for June. The total precipitation for the month was 2.95 inches. The maximum temperatures recorded for each week were 92° on the 5th and on the 6th, 87° on the 17th, *100° on the 20th* and 99° on the 25th and on the 26th. The minimum temperatures were *50° on the 1st*, 52.5° on the 10th, 52° on the 11th and on the 14th, 61° on the 23rd and 51° on the 30th.

ACCESSIONS

LIBRARY FROM FEBRUARY 1 TO APRIL 23 (*continued*)

SMITH, ELMER D. *Chrysanthemum manual.* Ed. 5. n. p. 1922. (Given by the author.)

SMITH, ERWIN FRINK. *Bacteria in relation to plant diseases.* Vols. 2, 3. Washington, 1911–14. (Given by the Carnegie Institution of Washington.)

SORAUER, PAUL CARL MORITZ. *Handbuch der Pflanzenkrankheiten.* Ed. 4. 3 vols. Berlin, 1921 23.

STAGER, WALTER. *Tall bearded Iris.* Sterling, 1922.

TAYLOR, JOHN ELLOR. *The sagacity and morality of plants.* New ed. London, 1891.

VACHEROT, JULES. *Les parcs et jardins au commencement de XXe siècle.* Paris, 1908.

VALLEMONT, PIERRE LORRAIN. *Curiositez de la nature et de l'art sur la vegetation: ou l'agriculture et le jardinage dans leur perfection.* Paris, 1705.

VANDAS, CARL. *Reliquiae Formanekianae.* Brunae, 1909.

WARMING, JOHANNES EUGENIUS BÜLOW, & GRAEBNER, PETER PAUL. *Lehrbuch der ökologischen Pflanzengeographie.* Ed. 3. Berlin, 1914–18.

WHELDALE, MURIEL. *The anthocyanin pigments of plants.* Cambridge, 1916.

WILLIS, JOHN CHRISTOPHER. *A dictionary of the flowering plants and ferns* Ed. 4. Cambridge, 1919.

WORSDELL, WILSON CROSFIELD. *The principles of plant-teratology.* 2 vols. London, 1915–16.

YARD, ROBERT STIRLING. *The book of the National parks.* New York, 1921.

ZICKENDRATH, ERNST. *Beiträge zur Kenntniss der Moosflora Russlands* 2 parts. Moskau, 1894 1901.

ZOPF, FRIEDRICH WILHELM. *Zur Morphologie der Spaltpflanzen* (Spaltpilze und Spaltalgen). Leipzig, 1882.

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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIV August, 1923 No. 284

JOURNAL

OF

The New York Botanical Garden

EDITOR

H. A. GLEASON

Assistant Director

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PRICE $1.00 A YEAR; 10 CENTS A COPY

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INTELLIGENCER PRINTING COMPANY

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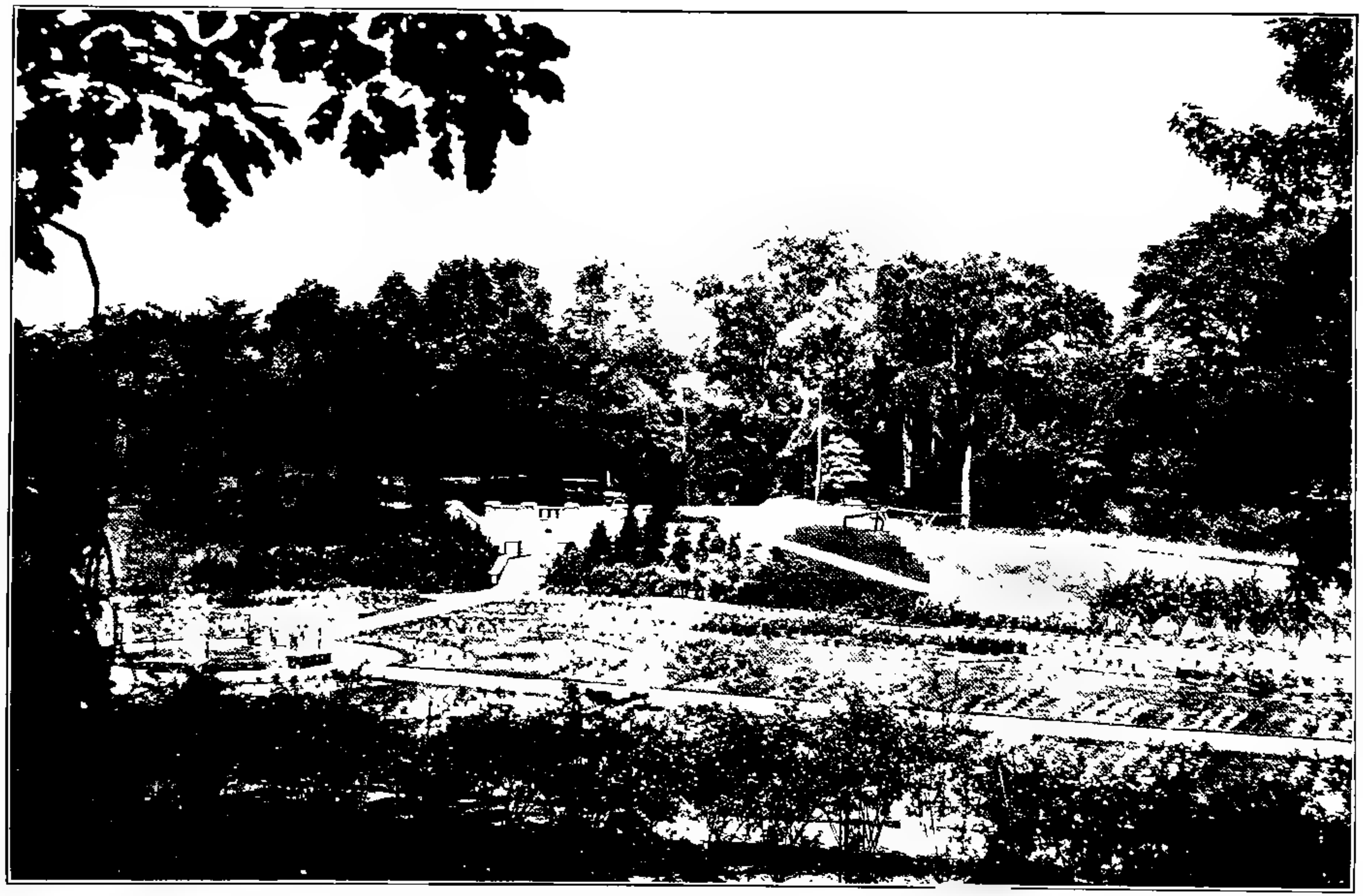

THE ROSE GARDEN, JUNE 19, 1923

JOURNAL
OF
The New York Botanical Garden

Vol. XXIV August, 1923 No. 284

THE CABBAGE-TREE—SABAL PALMETTO

Not one of our native palms was described by Linnaeus.[1] Very few specimens of continental North American plants from the regions inhabited by our palms came under his examination, he having had scarcely any specimens from south of Virginia.

It was not until thirty-five years after the publication of his "Species Plantarum" (1753) and ten years after his death that the first palm of the United States was botanically named.

A very early reference to the cabbage-tree, perhaps unknown to Linnaeus, is contained in a little book by Jonathan Dickenson, entitled:

"GOD'S PROTECTING PROVIDENCE, MAN'S SUREST HELP AND DEFENSE, IN TIMES OF GREATEST DIFFICULTY, AND MOST IMMINENT DANGER, EVIDENCED IN THE REMARKABLE DELIVERANCE OF ROBERT BARROW, WITH DIVERS PERSONS, FROM THE DEVOURING WAVES OF THE SEA, AMONGST WHICH THEY SUF-

[1] Carl Linnaeus was born 13/14 May 1707, at Rashult, Småland, Sweden. His interest in botany dated from his youth. At twenty he began his university studies at Lund, going to Upsala in the following year. In 1732 he traveled in Lapland, under the auspices of the Upsala Academy and during the next few years visited various parts of Sweden, Denmark, Germany, Holland and England. In 1735 he received the degree of doctor of medicine in Holland, and made his home in that country for several years. It was while there that he published the details of his artificial "sexual system" of plant classification, which soon made his reputation world-wide, and was used exclusively by nearly all botanists for almost a hundred years. In 1738 he returned to Sweden, and became a practising physician in Stockholm; from 1741 he was a professor in the university at Upsala, where he remained until his death, 10 January 1778, publishing meanwhile numerous books, botanical and zoological; the most famous is his "Species Plantarum," 1753, which is now accepted as the starting-point of modern botanical nomenclature. —JOHN HENDLEY BARNHART.

On Indian Prairie west of Lake Okeechobee.—Prairie in foreground. Scattered cabbage-trees, and cabbage island in background, other islands in the distance. In these larger islands the Seminole builds his villages, the palm furnishing the material for the structures. In clearings he plants his fields of corn. This prairie, occupying approximately one hundred and fifty thousand acres, is one of the most remarkable palm regions of the world.

FERED SHIPWRECK; AND ALSO FROM THE CRUEL DEVOURING JAWS OF THE INHUMAN CANNIBALS OF FLORIDA." Philadelphia, 1699.

Dickenson and his shipwrecked British associates walked along the coastal sand-dunes from Jupiter Island to Saint Augustine and Saint Mary's under the protection (?) of the Florida aborigines, now extinct, and the Spanish. The following quotation from page 76 of the fifth edition of the above-cited work is among other references to the experiences of the party, apparently in the Halifax River region.

". . . but being nigh the Shore, where had been an Indian Town, we went thither and found some ripe Berries on the Palm Shrubs."

However, the existence of the cabbage-tree could scarcely have been unknown to Linnaeus, for there were long descriptions of it published before and after the middle of the eighteenth century, and Linnaeus himself refers to it in a letter by him dated December 27, 1765, when he wrote to John Ellis[1] about a plant from Madeira.

"Lord Hillsborough received last summer, from Madeira, seeds of the Dragon Palm, and they are as they are described, about the size of a pea, quite round, and horny, like the seeds of Palmetto from South Carolina. I shall write for some specimens of the flowers. I am not of Mr. Loefling's opinion that they belong to the Asparagus."[2]

Mark Catesby[3] wrote quite fully concerning the subject of

[1] John Ellis was born in Ireland, probably in Dublin, about 1710. He became a merchant in London, and amassed a considerable fortune. In 1751, he became interested in the study of marine algae and other forms of aquatic life, especially what were then called "corallines," which he soon realized were some of them animals and others plants. Later he studied fungi and flowering plants. He was appointed King's agent for West Florida in 1764, and for Dominica in 1770, and imported to England many scientific specimens of various sorts, especially seeds of useful plants. Among his correspondents were Linnaeus, and Dr. Alexander Garden of Charleston, South Carolina. He died at London, 15 October 1776.—J. H. B.

[2] Correspondence of Linnaeus and Other Naturalists 182. 1821.

[3] Mark Catesby was born at Sudbury, Suffolk, England, in 1679. He spent seven years in Virginia before he was forty years old and was so impressed with the strange natural objects about him that he resolved to return to America for the sole purpose of studying them. He arrived at Charleston in 1722, and collected and painted plants and animals in South Carolina,

this paper as early as 1732,[1] in fact too fully about the "Plant Palmetto." The description runs as follows:

"This Palm grows not only between the Tropicks, but is found further North than any other. In Bermudas[2] its leaves were formerly manufactured, and made into hats, bonnets, etc., and of the berries were made buttons. This is the slowest grower of all other trees, if credit may be given to the generality of the inhabitants of Bermudas; many of the principal of whom affirm'd to me, that with their nicest observations they could not perceive them to grow an inch in height, nor even to make the least progress, in fifty years: yet, in the year 1714, I observed all these Islands abounding with infinite numbers of them of all sizes. This kind of Palm grows also on all the maritime parts of Florida and South Carolina; whose Northern limits being in the latitude of 34 North, is also the farthest North that these Palms grow to their usual stature, which is about 40 feet high, yet they continue to grow in a humble manner as far North as New England, gradually diminishing in size as they approach the North, being in Virginia not above four feet high, with their leaves only growing from the earth, without a trunk, yet producing branches of berries, like those of the trees. In New England they grow much lower, their leaves spreading on the ground. This remarkable difference in the same plant has been the cause of their being thought different species, though I think they are both the same, and that the smallness of the Northern ones is occasioned by their growing out of their proper climate, which is hot, into a much cooler one, where the heat of the Sun is insufficient to raise them to trees."

The reference to a palm growing wild in New England is fantastic. How Catesby got the idea or the information to lead him to write such a statement is a mystery.

Georgia, Florida, and the Bahamas, for four years; the results appearing in his sumptuous "Natural History of Carolina, Florida, and the Bahama Islands," published in 11 numbers (1730–48), and completed only shortly before his death, which occurred in London, 23 December, 1749. His collections are represented in the Sherard herbarium at Oxford and the Sloane herbarium.—J. H. B.

[1] Natural History of Carolina, Florida and the Bahama Islands.—XVI.

[2] The Bermuda plant was later distinguished as *Sabal Blackburnianum.*

Thirty years later—1762[1]—Catesby wrote more sanely of the Palmetto tree of Carolina as follows:

"This is the only species of that numerous and useful genus of trees, the Palm, that is found to grow without the tropics: I observed it as far north as the latitude of thirty-four degrees, which being within the climate from whence our American hardy trees have been introduced [into England], I conceive it not improbably that this tree, by a little protection, may be brought to endure our climate and adorn our gardens with its ample foliage: its vicinity, with many hardy trees which now are naturalized to England, would induce one to conclude that this tree also, as well as those, may be able to bear the cold of our country; but as all American trees of the same latitude are not equally hardy, trial only can determine how far this tree is capable of abiding the open air of our climate. Was the singular and specious appearance of these trees known to the Curious, there would need no other excitement to the desire of procuring them, which with no great difficulty may be effected from Charles Town in South Carolina; within four miles of which is a little island, six miles in circuit, called Sullivan's Island, abounding with Palmetto-trees of all dimensions. The roots of these trees growing within a small compass, and their fibres being closely connected, small trees may be taken up with sufficient earth adhering to their roots, put singly in tubs of earth, and supported by a stake or stakes."

"The leaves are more than semicircular; and some of them so broad, that they measure six feet diameter. These trees are found in Carolina from ten to fifty feet in height. This, as well as the other kinds of Palms, has its peculiar use; particularly its leaves are used for the walls and coverings of houses; making hats, baskets, ropes, with many other utensils. The berries are globular, as big as cherries, of a luscious sweet taste; and is a great part of the food of the maritime Indians."

"Sir Hans Sloane observes, that the name of Palm seems best to agree with this kind, because the leaf resembles a hand more than any of the other sorts."

This paper is accompanied by an elaborate plate—a good diagrammatic representation of the cabbage-tree.

[1]Hortus Europae Americanus 40.

On Indian Prairie.—Seminole Indian barn and barnyard in a cabbage clump in foreground, cabbage islands in background. The fence is of the trunks; the barn of the trunks and palm-leaf thatch—all built of palms growing in this clump. Here, as throughout its range, some palms are naked, others retain their "boots" or persistent leaf-bases. The palm on the extreme right has a ladder over which access is gained to the enclosure.

Shortly after Catesby's last paper on the cabbage-tree, John Bartram[1] referred to it several times in a work by William Stork that appeared in 1765, under the following title:

"An Account of East Florida: with a Journal Kept by John Bartram, of Philadelphia, Botanist to His Majesty for The Floridas, upon a Journey from St. Augustine up The River St. Johns."

"We now came to plenty of the tree palmetto, which the inhabitants call cabbage-tree, and is much eaten both raw and boiled. . . . and the long trunks of this palm serve very well for pipes to carry water, and when split in two make excellent long troughs or conduits to carry water from place to place above-ground."

". . . here we cut down three tall palms or cabbage-trees, and cut out the top bud, the white tender part or rudiments of the great leaves . . . ; this tender part will be 3 or 4 inches in diameter tapering near a foot, and cuts as white and tender as a turnip; this they slice into a pot and stew with water, then when almost tender, they pour some bear's oil into it, and stew it a little longer, when it eats pleasant and more mild than a cabbage. . . . Our hunters frequently eat it raw, and will live upon it several days; . . ."

". . . ; we camped on a descending bank on the back of which was scrub-oak and dwarf-palmetto or chamaerops; here we cooked a fine mess of palm-cabbage."[2]

[1] John Bartram was born 23 March 1699, at Marple, near Darby, Pennsylvania. He had been a farmer for several years before he became interested in botany, and was then for the most part, and of necessity, as he knew no one else interested in the science, self-taught. He traveled widely, from New York to Florida, and corresponded with various eminent naturalists abroad, especially with Collinson of London, who was, like himself, a member of the Society of Friends. About 1729, Bartram established at Kingsessing, then a suburb but now a part of the city of Philadelphia, the first botanic garden in America. For nearly fifty years an almost continuous stream of American seeds and plants, sent by Bartram, poured into the gardens of Europe. In 1765, he was appointed King's Botanist, and the modest salary accompanying this appointment enabled him, in spite of advancing age, to extend his scientific travels. In that year and the next, accompanied by his son, he explored the St. Johns River, Florida, and several of its tributaries. He died at Kingsessing, 22 September 1777. —J. H. B.

[2] These three quoted paragraphs are from the above cited work, by William Stork, pages 10 (reprint 37), 20 (reprint 43), 23 (reprint 45) respectively.

It remained for a resident of South Carolina formally to describe and publish the cabbage-tree. The name of Thomas Walter[1] and his State, South Carolina, will always be closely associated with it. In his small original botanical classic,[2] Walter prints, "Corypha Palmetto 2. arborea, frondibus medio conniventibus, margine expansis."

About twenty-five years later, William Baldwin[3] writing, in 1816, of his travels in Georgia and Florida said:

"The Chamaerops Palmetto is an elegant plant,—attaining, in Georgia, to the height of forty or fifty feet; and all its valuable uses have not been enumerated by Mr. Pursh. The tender shoot, at the extremity of the young plant, affords an article for the table, more sweet and delicious than cabbage; from which it has derived the name of "Cabbage tree." After stripping off the leaves, a white delicate substance remains, resembling Asparagus,—but which may be obtained three or four inches in diameter, and two feet in length. It may be eaten raw, but when boiled, and dressed with butter, affords a nutritious and very agreeable article of diet."[4]

Thereafter references to this then unique plant of the flora of the United States became more numerous. One of the more

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The reprint was issued from the office of The Florida Mirror, Fernandina, Florida, 1881.

[1] Thomas Walter, who was born in Hampshire, England, about 1740, settled in South Carolina as a planter in early life His "Flora Caroliniana" (1788) is astonishing when considered as the work of a solitary student in an isolated field, and will ever maintain its position as a botanical classic. He died in St John's Parish, South Carolina, 18 January 1789; his grave, in what was once his garden, the second botanical garden established in America, is now a forest wilderness. The British National Museum contains a collection of plants made by Walter, presumably several years before the publication of his Flora.—J. H. B.

[2] Flora Caroliniana. 1788.

[3] William Baldwin was born in Newlin township, Chester County, Pennsylvania, 29 March 1779. He visited China as surgeon on a merchant vessel in 1805, and received his medical degree from the University of Pennsylvania in 1807. From 1812 to 1818 he was a surgeon in the United States navy, most of the time stationed in Georgia or Florida. Appointed surgeon and botanist to Long's expedition up the Missouri, he died at Franklin, Missouri, 1 September 1819.—J. H. B.

[4] Reliquiae Baldwinianae 343. 1843.

extensive and complete descriptions was by F A. Michaux[1] who was a particularly interested student of the forest trees of North America. In his Sylva,[2] of *Chamaerops Palmetto* he says under the head of Cabbage Tree:

"From its lofty height, this vegetable is considered in the United States as a tree; and upon the shores of the Ocean, where it grows, it is called Cabbage Tree. It belongs to the genus of the Palms, and is found farther north than any other species in America, being first seen about Cape Hatteras, in the 34th degree of latitude, which, in the temperature of the winter, corresponds with the 44th in Europe. From Cape Hatteras it spreads to the extremity of East Florida, and probably encircles the Gulf of Mexico; I have no doubt that it exists also in Cuba and the Bahama Islands; I have seen it in Bermuda, which is more than 600 miles from the coast of North America.

"Farther south the Cabbage Tree is not confined, as in the United States, to the immediate vicinity of the sea; on the river St. John, in Florida, a few miles above Lake George, I caused two stocks to be felled at the distance of 40 or 50 miles from the shore."

* * *

"The base of the undisclosed bundle of leaves is white, compact and tender; it is eaten with oil and vinegar, and resembles the artichoke and cabbage in taste, whence is derived the name of Cabbage Tree. But to destroy a vegetable which has been a century in growing, to obtain three or four ounces of a substance

[1] François André Michaux was born 16 August 1770, at Versailles, France, where his father was in charge of the royal estates. With his father, André Michaux (1746–1802), author of the "*Flora Boreali-Americana*," he visited America from 1785 to 1790. He was in America again, with Charleston as his headquarters, from October 1801 until March 1803, traveling meanwhile from New York to South Carolina, and in Kentucky and Tennessee. He traveled even more extensively in the eastern United States, from Maine to Georgia and west to Ohio, from 1806 to 1809 He was particularly interested in American forest trees, and is best known for his elaborate publications devoted to them. After his return to France in 1809, he devoted the rest of his life to arboriculture, and particularly to the cultivation of American trees and their distribution in France. In 1822 he received the honorary degree of doctor of medicine from Bowdoin College. He died suddenly, on his estate Vauréal, near Pontoise, in the department of Seine-et-Oise, 23 October 1855.—J. H. B.

[2] The North American Sylva 3: 1 3. 1819.

neither richly nutritious nor peculiarly agreeable to the palate, would be pardonable only in a desert which was destined to remain uninhabited for ages. With similar prodigality of the works of Nature, the first settlers of Kentucky killed the Buffalo, an animal weighing 12 or 15 hundred pounds, for the pleasure of eating its tongue, and abandoned the carcass to the beasts of the wilderness."

"The Cabbage Tree bears long clusters of small greenish flowers, which are succeeded by a black, inesculent fruit, about the size of a pea."

"In Southern States the wood of this tree, though extremely porous, is preferred to every other for wharves: its superiority consists in being secure from injury by sea-worms, which, during the summer, commit such ravages in structures accessible to their attacks; but when exposed to be alternately wet and dry in the flowing and ebbing of the tide, it decays as speedily as other wood. This use of the Cabbage Tree is rapidly diminishing its numbers, and probably the period is not distant when it will cease to exist within the boundaries of the United States."

Of course, in addition to both the easily accessible and buried printed literature about this palm, there is, doubtless, much contained in unpublished correspondence.

The following paragraphs from a letter of Dr. G. W. Hulse[1] in the unpublished correspondence of Dr. John Torrey[2] is in-

[1] Gilbert White Hulse was born 12 March 1807, in Blooming Grove township, near Washingtonville, Orange County, New York. He studied medicine at the College of Physicians and Surgeons in New York City, receiving his degree in 1835. He immediately entered the medical service of the United States Army, being stationed at Tampa Bay from February to April, 1836, in Arkansas during the summer and fall of the same year, returning to Fort Brooke, Florida. In 1837, he went again to Fort Gibson, Arkansas, returning to Fort Brooke in January, 1838. He was at Tallahassee in March, and before the middle of the year 1838 had settled as a medical practitioner at Rodney, Mississippi. Later he was a planter in Louisiana, and about 1850, he visited northern California, where he collected plants for Torrey as he had done in Florida and Mississippi. Throughout the Civil War he was a surgeon in the Confederate Army, and at its close, his property gone, he returned north, making his home at first with his sister, Mrs. Moffatt, at Rockford, Illinois, and later with her daughter, Mrs. Knapp, at Auburn, New York, where he died 13 November 1883.—J. H. B.

[2] John Torrey was born in New York City, 15 August, 1796. As a boy he became interested in botany and chemistry. When he was only twenty years old, and a student of medicine, he was one of the group of young men

structive, as it contains information gathered first hand relating to the uses of this palm by the Seminole Indians. It was, doubtless, similarly used by the aborigines who preceded the Seminoles.

"I send you also by the same vessel the top of a Cabbage palmetto or *Chamaerops palmetto* which grows abundantly on the sea coast in the southern country. As this is an important article to civilized man, as well as the savage, I have thought it might be interesting to you. The body or caudex is very durable in salt water and said to be proof against worms that are so destructive to ships. It is much used for building wharves in this country."

"The Seminole obtains a rich article of food from the young leaves in the top, from the abundance of its berries he supplies his molasses, when hard pressed for bread stuff he beats from it a coarse kind of flour, and it is said that they obtain salt from it by a process similar to ours for obtaining potash from wood. These are all luxuries too coarse for refined society. Still you see the Seminole lives on something more really substantial than air, and perhaps your curiosity to know whether the very trees of the country are made up in nice proportions of salt, flour, and sugar, may induce you to satisfy us as to the chemical properties of the plant."

In the same decade in which the above-quoted letter was written, or almost a century after this decidedly characteristic tree was referred to in detail by Mark Catesby, it was finally

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who, under the leadership of Professor Mitchill, organized the Lyceum of Natural History, now the New York Academy of Sciences, and within a year as one of the members of a committee appointed by the Lyceum, prepared a catalogue of plants known to occur within thirty miles of New York City. Upon receiving his degree, in 1818, he entered upon the practice of medicine in New York City; from 1824 to 1827 he was professor of chemistry and mineralogy at West Point; from 1827 to 1873, professor of chemistry at the College of Physicians and Surgeons (now the medical department of Columbia University), for some years also concurrently professor of chemistry at Princeton and botanist of the geological survey of New York State; and from 1857 to 1873 United States Assayer at the New York office. In spite of the fact that his professional work was all in medicine, chemistry and mineralogy, his first interest was always in botany, to which he devoted all the time he could find for the purpose for more than fifty years, publishing numerous books and papers, and gaining a world-wide reputation in this science. He was the first president of the Torrey Botanical Club, which was named in his honor. He died in New York City, 10 March 1873.—J. H. B.

placed in the genus in which it is now generally acknowledged to belong, namely, *Sabal*. The cabbage-tree stands at one extreme of the genus *Sabal*, while the blue-stem or dwarf-palmetto, the first one of our palms to be described and published and the type of the genus *Sabal*, stands at the other.[1] The leaf of the dwarf-palmetto or blue-stem has a very short rachis, whereas that of the cabbage-tree has it extended far into the blade, thus giving the blade a pinnate-flabellate character. The sabals with this kind of leaf were grouped together in the genus *Inodes*[2] several years ago. The cabbage-tree now ranges further north along the Atlantic than any other of our species. Curiously enough, however, it is absent from the Gulf Coast westward of Saint Andrew's Bay, Florida, although conditions along the Gulf of Mexico seem to be as favorable for its growth, at least nearly or quite as much so as those that obtain along the Atlantic coast north of Florida. Its absence from the Gulf Coast may be occasioned by cold storms that sweep down through the Mississippi Valley, where there is less high land and no mountains to temper their icy winds as there are on the Atlantic seaboard.

However, this well-marked north-south extension of range may be the result of the passage of migratory birds plus favorable temperature conditions. Peninsular Florida is, and perhaps was formerly, the center of the geographic distribution of the cabbage-trees. The general course of flight of migratory birds is north and south, and not east and west. Birds may have carried the seeds of this palm northward. Although they may retain the seeds of *eaten* fruits but a short time, year after year they may have carried the seeds further and further northward in the Coastal Plain. By slow stages of progress the palm could thus have gradually accommodated itself to a cooler and more changeable climate, until it reached the limit of endurance at Cape Hatteras.[3]

At Cape Hatteras the coast line turns to the northwest, and thus north of the Cape the shore has a northeastern exposure.

[1] For a history of the blue-stem, see Journal of the New York Botanical Garden **23**: 161–168. 1922.

[2] Bull. Torrey Club **28**: 529. 1901.

[3] For notes on the recent northern extension of the geographic range of the silver-palm, see Journal of the New York Botanical Garden **23**: 152. 1922.

Consequently, a great deal of the warmth derived from the angle of the sun's rays on the land south of Cape Hatteras, as well as the effect of the warm air from the great expanse of heated water lying between the coasts of the Carolinas and the distant Gulf Stream and the West Indies, is lost to the coastal region north of Cape Hatteras.

Thus the geographic range of the cabbage-tree peters out at Hatteras. In North Carolina it grows on the islands lying outside of the coastal lagoons. In South Carolina it becomes more plentiful and extends further inland. It is likewise distributed in Georgia. The climate and surface of Florida are better adapted to its growth and we find the cabbage-tree nearly throughout the State, except in the extreme western arm.

The early settlers found it in abundance along and near the coast—in quantities that justly surprised them. It ranges in an almost unbroken stretch from the Saint Mary's River on the Atlantic to Saint Andrew's Bay on the Gulf. Yet it is plentiful in the interior of the peninsula and reaches its maximum development on the great Indian prairie which lies between Lake Okeechobee and the Pease River water-shed. This prairie is often referred to as the Palmetto Prairie.

The cabbage-tree is amphibious. Its habitat ranges from perpetual water to permanently dry rocks. It thrives also in localities that are dry part of the year and submerged the other part. It will flourish perfectly well where there is an annual or periodic change of the water-level amounting to six feet. This adjustment to varying depths of water is accomplished by a massive root development from the normal development below the surface of the ground, be it mud or sand, along the trunk to the highest water level. Thus, on the lower part of the trunk one may find a solid mass of roots, in the form of a cylinder, often six to eight feet in diameter. When the water is high these roots are evidently active, when it is low they are practically, of necessity, dormant. During the dry season these mounds of roots are covered with flowering plants when the surrounding mud or sand is barren. Persicarias, primrose-willows, false-loosestrifes, grasses, sedges, and other homely plants flourish there; but the showy plants are more commonly the beautiful Carolina-aster and the fragrant hemp-weed, both of which clamber and climb up the trunk itself for many feet.

The cabbage-tree is not particular as to the kind of water it gets its moisture from. Fresh water or salt water, hard water or soft water or sulphur water all suit it equally well.

We find the cabbage-tree in two conditions, either naked below the crown of leaves, or with "boots" on. The "boots" are the leaf-bases, and they are inclined to persist for a long time on the trunk. Two causes, however, remove them. First, *time;* being softer than the trunk they will eventually decay and fall off. Second, *fire;* successive fires will remove them much quicker than the normal disintegration of the tissues.

As in the case of many plants of Florida and the southeastern Atlantic seaboard, the cabbage-tree has a counterpart in the southcentral United States. It is the cabbage-tree (*Sabal texanum*) of southern Texas and adjacent Mexico.

The Sabal of the Bahama Islands is apparently identical with that of the south Atlantic mainland. It has been described as a variety by the Italian palm-student Beccari,[1] but specimens from the Bahamas can scarcely be distinguished from specimens from Florida, and the aspect of the trees is quite alike.

The Sabal of the southern Cuban coast which forms great groves in the vicinity of Batabano, south of Havana, has quite the same aspect, but on account of differences in its flowers has been held by some botanists as a different species. There are two or perhaps three other sabals in other parts of Cuba, another in Porto Rico, another in Jamaica and another in Trinidad.

JOHN K. SMALL

NOTES ON THE ROSE GARDEN

(WITH PLATE 282)

The present season finds our rose garden nearly the same in general outline and constitution as when was first established. On the outside have been added from time to time a few select climbers, not materially changing the effect, which was the usual heavy display of bloom in June and beginning July only, but giving the public a view of some of the climbing roses until our permanent collection of these could be established. During the first seasons of its existence the rose

[1] Webbia **2**: 38. 1907.

garden served as a practical test garden for hundreds of varieties, a few bushes of each; many of these sorts have died out, some have survived, not only drought, wet feet, and severe winters, but also one or two transplantings; hence they deserve some consideration in our discussion. Before taking up the changes made in the garden and the ensuing successful season there, it may be well to record something of the behavior of some of the varieties grown during the years 1917–1922, especially of those which are not now in our main beds.

Amateur Teyssier, one of the older yellow varieties, was one of a great many sorts of which a few plants held on gamely to the end, but never made enough growth or produced enough flowers to make a worth while show. Our *American Beauty* was an utter failure as an outdoor rose, and *Richmond*, the rich red, American favorite greenhouse rose was never strong, and lost prestige in comparison with some of our other reds; *Augustine Guinoisseau*, one of the older French white varieties, was kept up only by being constantly replaced; and of the *White Killarney* bed, many were weak growers and several dropped out each season. *Arthur R. Goodwin*, one of the early Pernetiana roses, with copper-orange-salmon blooms, could not stand the conditions here, but *Willowmere*, the 1913 Pernetiana, named in honor of Admiral Ward's home, has more than held its own—we might say it has proved hardier here than any of the other Pernet-Ducher roses. One of their varieties of 1908, *Mrs. A. R. Waddell*, one of the golden salmons, was an early victim of winter killing, and *Mme. Jenny Gillemot*, *Mme. Charles de Luze* and *Beauté de Lyon* were never more than moderately vigorous. *La France* herself, originally planted in two different parts of the garden, could attract no notice on account of bloom, and of 50 or more planted none worth transplanting were left last fall. The famous Dickson roses, *Irish Fireflame*, *Irish Simplicity*, and the others we kept as long as possible for their patrician slender buds and rustic wide-open flowers, but only by being coddled and humored; their usefulness and hardiness for our garden are clearly shown to be lacking. The tea roses planted and tested, the *Maman Cochet* roses and others, were likewise weak and tender growers; it is worth while to grow a few of these for variety study, but not for display. One of the most interesting and in a way practical results of the first five

years, was the weeding out of many of these varieties, and the survival of certain varieties, many of them neglected in our discussions and reviews of the rose field. In some instances the survivors are only a few robust plants of the original number; in others the whole group of plants of the one variety remain, medium growers and bloomers, not attractive to all rose lovers, but commendable for their persistence. *Ecarlate*, one of the older red roses, with clean lustrous foliage and a quantity of only semi-double, flat blooms, a great color maker, has stayed with us and produced faithfully throughout each season. If one likes a light scarlet rose, this variety is unexcelled for planting en masse. *Reine Marguerite d'Italie*, another uncommon red variety, is blooming very freely this year in exactly the same location as originally planted. It has at times some tight, heavy buds which decay without opening during wet weather. Of *Crimson Champion*, a short crimson rose advocated for bedding, and originated in America by John Cook, it was always necessary to replace a few plants, but 75 per cent survived our worst winters and a group of these same plants are still giving a crimson display. Another semi-double red, *Red Letter Day*, has proved fairly hardy. *Indiana*, the old E. G. Hill rose of reddish-pink shade, is represented by a dozen plants of the original lot. It has nicely shaped, if small, buds, with an elusive tea fragrance, and clean, light green foliage. *Mrs. Andrew Carnegie*, a white rose often lost sight of in the midst of June plenty, has always given a great many large rounded buds and blooms, and of the small number of plants, nearly all are still alive. *Gen.-Sup. Arnold Janssen*, a 1912 carmine rose, while somewhat short and spreading in habit with us, has carried on consistently and bloomed well into the autumn until transplanted last year. Then *Gruss an Teplitz*, that old reliable red, has set a mark for all the rest—no deaths, no disease, no insects, and rich velvety blooms. One or two robust growing hybrid teas, especially strong in cane and foliage growth, (varieties with every appearance of hybrid perpetuals), have made impressive records for five years. One of our favorites is *Hon. Ina Bingham*, with light green, soft foliage and wide-opening, soft pinkish-white blooms.

In the fall of 1922, these strong plants of surviving varieties, including the fine collections of *Radiance*, *Red Radiance*, *Mrs. Wakefield Christie-Miller* and *Jonkheer J. L. Mock*, were moved

into the outside row of beds of the inner or main portion of the garden. Some twelve varieties of Baby Ramblers (Dwarf Polyanthas) were planted with them to fill in and give extra color. These Polyanthas had filled the innermost circle of beds. In preparing to receive the plants for the entire renovation of the main part of the garden, an application of leaf mold to lighten the soil and add humus was made and the old beds thoroughly dug and some dozen new ones made. Under the direction of Mr. John Finley, Foreman-Gardener, and Mr. John Baardse, representing Bobbink and Atkins, of Rutherford, N. J., whose generosity made possible the replanting of the gardens, about 2200 plants were put in place before the planting season ended. These were a very uniform lot of strong field-grown plants, given by Bobbink and Atkins, selected and planted under Mr. Baardse's plans, with white roses for the center of the garden, then pinkish-white, yellow, pink and red, progressing to the outer beds. Five hundred more plants were set this spring, and the pressure of spring work necessitated leaving a few replacements to be made in the fall. In their over winter struggle, the bulk of the plants were victorious, being cut back sharply but not at all harmed at the roots.

Our season commenced with the Chinese *Rosa Hugonis*, which gave, in May, long arching branches covered with hundreds of single, rich yellow blooms. Then came the Rugosa or Ramanas roses, with heavy, durable, rich green foliage and dark red, pink, and white blooms of delightful fragrance. We have *Conrad F. Meyer*, large, double, rose-pink; *Blanc Double de Coubert*, with clear white, semi-double blooms; *Nova Zembla*, *Mme. Bruant* and *Sir Thomas Lipton*, also white; *New Century* with double pink; and *Hansa* and *Roserie de l'Hay*, with dark red blooms. In June, the Sweet Briars, Moss Roses, and Hybrid Perpetuals, in the outer beds of the garden with the Rugosas and others, gave us the typical June display. These were supplemented by a group each of *Dr. W. Van Fleet* and *Silver Moon*, the Wichuriana climbers originated by the late Dr. Walter Van Fleet, the distinguished rosarian and hybridizer; by *Ghislaine de Feligonde*, a hybrid Multiflora rose with many clusters of small yellowish-white blooms; by *Marie Jeanne*, another hybrid Multiflora with magnificent masses of almost white bloom; and by a group of *Paul's Scarlet Climber*, the great

display of scarlet bloom from this rose attracting the attention of most visitors seeking something in climbing roses.

In the Hybrid Tea class, the display of the new plants was beyond expectation. The silvery-pink *Radiance* and its counterpart *Red Radiance*, the favorite *Ophelia*, the globular pink *Mrs. Wakefield Christie-Miller*, being exceptionally vigorous, got an early start and bloomed freely; *Lady Ashtown*, a light carmine pink Dickson rose gave us the earliest complete show of its color, being covered for nearly three weeks with a sheet of bloom; *Lady Pirrie*, a salmon pink, exquisite in shape, was one of the better early performers; and *Lady Alice Stanley*, a deeper pink, gave some of the largest blooms. While most of the white roses were still getting their growth, *Florence Pemberton*, which is almost clear white, being only slightly suffused with pink, this year produced in quantity the largest blooms of any rose in the garden; they lasted well and were on tall strong canes. The new bed of *Ellen Wilmott*, with wide spreading white petals from pink centers, bloomed freely; *Antoine Rivoire*, *Grange Colomb* and *Prince de Bulgarie* were other good pinkish-whites. All of the red varieties did well, especially *George C. Waud*, *Mme. Meha Sabatier* (which seems to prove the claim made for it that it does not turn purple with age), *Red Star*, and *General MacArthur;* these were the best reds for early bloom.

The yellow roses were only fair performers in June, but the bronze-copper-orange group of the Pernetiana type put on their typical growth, beautiful foliage and a generous supply of blooms. The new beds of *Mme. Edouard Herriot*, *Marie Adelaide*, *Wm. F. Dreer*, *Miss Lolita Armour*, *Willowmere*, and *Louise Catherine Breslau*, were objects of great interest to visitors. To describe or distinguish them is hardly possible.

After June, begins the season which is critical in our rose gardens, public ones particularly, the long season of summer and September, which rosarians are striving to fill with bloom. Most rose gardens are showy in June, but what of July and August? The new plantings, on a site well-watered beneath, have been especially favored to withstand our July dry spell, have withstood it, with no help from the hose or watering-pot, so well that they have put on a strong growth of new canes, furnished with a more than satisfactory amount of buds and flowers, and in many varieties a quality of bloom above that of June.

Francis Scott Key, with its large blooms with rolled-back petals; *Jonkheer J. L. Mock*, with its heavy tight buds; and the little yellow *Mrs. Aaron Ward*, had more wood and much better flowers than in June. *H. V. Machin*, a big red rose, grew three-foot canes each topped by magnificent blooms; *Joseph Hill*, a weak grower in June, gained fine foliage and increased bloom; *Mme. C. Chambard*, pink, *Lieutenant Chauré*, red, *Mme. Ravary*, yellow, *Golden Ophelia*, *Miss Cynthia Forde*, *Etoile de France*, *Mabel Drew*, *Duchess of Wellington*, really a *good* yellow rose in July, *Pharisaer*, and many others were better in July than in June. *La Tosca*, *Lady Ursula*, and *Mme. Léon Pain* like to send up long canes, and flower high, so they are fine summer bloomers in our garden.

Mention of the rose garden in 1923 should include one of the new beds which contained four excellent roses, varieties which carried an unusual display of bloom, curiously, of diverging type. These varieties were *Bloomfield Abundance*, with salmon-pink, pointed buds, small in size but large in quantity, of the type of the well-known *Sweetheart* or *Cecile Brunner* rose, and originated by Capt. Geo. C. Thomas; *Dean Hole*, a large salmon-pink rose with pointed bud and flower of the general hybrid tea shape; *Marquise de Ganay*, silvery-pink blooms of heavy, globular type, literally massed on very sturdy plants; and *Queen of Fragrance*, a vigorous shell-pink rose which was delightfully fragrant. As to disappointments and surprises, *Mme. Butterfly* did not prove to be better than the beautiful *Ophelia*, of which it is a sport. On the other hand *Betty*, a Dickson rose, which had been rather weak in previous seasons, grew tall, stately, and flowered freely and generously in June, and was still better in July.

KENNETH R. BOYNTON

INVESTIGATION OF THE HEMLOCK FOREST

The New York Botanical Garden is cooperating with the Yale Forest school, together with the forest schools at Cornell and Syracuse, in a study of hemlock. For a number of years the hemlock forest on the grounds of the Botanical Garden has attracted attention, not only because of its extent and age, but as being the most southerly outlier of this type of forest along the

Atlantic coast. The area, before coming into the possession of the Garden, had been in the hands of the Lorillard family for many years, and, so far as known, had never been cut over. Adjoining it on the south is a body of very old hardwoods, to all appearances a remnant of the virgin forest.

This hemlock stand has been commonly considered as a southerly remnant of a more extensive coniferous forest which covered the region after the retreat of the ice sheet, but which has been gradually crowded out by the advance of the deciduous forest. Whether or not this theory be correct, and recent evidence is tending to show it may have to be modified, the hemlock grove is of much scientific interest. The plan of the investigation drawn up by the Scientific Directors, and turned over for execution to a committee of three consisting of Barrington Moore, Chairman, Professor Herbert M. Richards, of Columbia, and Dr. H. A. Gleason, Assistant Director of the Botanical Garden, is divided roughly into two parts, field work and laboratory work.

The field work is the aspect in which Yale, Cornell and Syracuse are cooperating. Briefly, this calls for securing instrumental records of the environmental conditions under stands of hemlock growing in different localities. The Botanical Garden forest represents the southern edge of the type, where it is in severe competition with hardwoods; New Haven represents apparently more favorable conditions; Ithaca is nearer the center of the type; and the Syracuse station, which is at Cranberry Lake in the Adirondacks, represents the northern position, where the tree is in competition with spruce and fir.

The instrumental records cover weekly readings of evaporation, solar radiation (given roughly by Livingston radio-atmometer), maximum and minimum temperatures of the air and of the soil at six and eighteen inches depth, and precipitation. It is recognized that more elaborate data would be desirable, but practical features and expense had to be considered. The two Yale Forest School stations were selected, and one of them established on April 18. They are on Saltonstall Ridge on lands of the New Haven Water Company. The first station is on a north aspect; on a site which seems admirably suited to hemlock, judging by its abundant reproduction and thrifty growth. The second is on the top of the ridge where, in spite of the rocky and apparently dry character of the site, hemlock

forms a pure stand with abundant reproduction. Appearances point to the gradual extension of hemlock through hardwood forests of Connecticut which are protected from fire, and to an important future for this tree in forest management.

The station at Cranberry Lake, conducted by the State College of Forestry, Syracuse University, was set up on May 4, in a small group of very large primeval hemlocks surrounded by a virgin forest of spruce and northern hardwood. It is on part of the State Forest Preserve. The two stations conducted by the Department of Forestry at Cornell were set up on May 12, about two miles from Ithaca. One is in a pure forest of old hemlocks in a small valley bottom, the other is under hardwoods on a neighboring slope. Thus there are in all five stations under hemlock, two near New Haven, one in the Adirondacks, one at Ithaca, and one at the Botanical Garden in New York, two stations under hardwoods, one at Ithaca and one at the Garden in New York, and also one station in the open on the Botanical Garden grounds.

BARRINGTON MOORE

PUBLIC LECTURES DURING SEPTEMBER

Sept. 1. Nature Talks—VIII. "Useful Trees." Dr. W. A. Murrill.
Sept. 2. "Birds in Their Relation to Agriculture." Mr. L. W. Brownell.
Sept. 8. "A Winter in Southern California." Dr. A. B. Stout.
Sept. 9. "The Tree in the Landscape." Mr. E. F. Coe.
Sept. 15. "Wild Flowers of Autumn—How Seeds are Scattered." Dr. G. C. Fisher.
Sept. 16. "Swamps, Ancient and Modern." Dr. Arthur Hollick.
Sept. 22. "Dahlias and Their Culture." Dr. M. A. Howe. (Exhibition of Dahlias, September 21–23)
Sept. 23. "The Story of Wheat." Dr. Geo. M. Reed.
Sept. 29. "The Most Important Economic Plants of America." Dr. H. A. Gleason.
Sept. 30. "Chrysanthemums." Mr. C. H. Totty.

NOTES, NEWS AND COMMENT

Dr. Marshall A. Howe, Curator, has been elected to membership in the National Academy of Sciences.

Dr. A. B. Stout, Director of the Laboratories, spent two weeks late in July and early in August in northern Maine, continuing researches on seed sterility and fertility in potatoes, in cooperation with the Bureau of Plant Industry of the U. S. Department of Agriculture.

Dr. W. A. Murrill visited four Girl Scout camps in Interstate Park on July 30 and 31 and made two addresses on scouting and nature-study. The camps visited were occupied by Bronx, Manhattan, Brooklyn, and Montclair scouts, about 100 girls in each. Special attention is being devoted this season to museum work in the camps and the Park employs three trained assistants to give all their time to this phase of biology.

Fifty students from the summer sessions of Columbia University, under the leadership of Mr. L. W. Crawford, visited the Garden on August 1 and were shown through portions of the grounds and buildings. Beginning with Conservatory Range 1 and the flower gardens adjoining, the route led through the Herbaceous Valley to the Rock Garden, Iris Garden, and Gladiolus Plantation; thence through the Hemlock Grove and lake region to the Museum Building. Here the party divided, a few returning to Columbia and the remainder visiting the tree plantation and Conservatory Range 2. Some even got as far as the Rose Garden.

The library and herbarium of the late Professor Elias J. Durand have been purchased by Cornell University, from which institution he was graduated in 1893 and where he was connected with the botanical teaching staff from 1895 to 1910. He afterwards held professorships in the University of Missouri and the University of Minnesota. Dr. Durand was well known to mycologists as a critical student of the Discomycetes.

Miss Helen A. Purdy, who has been for more than a year an assistant to Dr. William A. Murrill, Supervisor of Public Instruction, has received an appointment as Bishop Museum Fellow and will sail in September for the Hawaiian Islands, where she will devote the coming year to studies of the Hawaiian fungi with special attention to those causing plant diseases. Miss

Purdy is a graduate of Barnard (1918) and has been an assistant in plant pathology at Cornell University and an instructor in botany in Vassar College. During the college year 1920–'21, she held an American-Scandinavian Foundation fellowship at the University of Copenhagen.

A beginning of the treatment of the Hepaticae was made in Volume 14, Part 1, of the North American Flora, which appeared on January 19, 1923. The text of the Sphaerocarpaceae and Riellaceae was contributed by Caroline Coventry Haynes and Marshall Avery Howe; the Ricciaceae by Marshall Avery Howe; the Corsiniaceae, Targioniaceae, Sauteriaceae, Rebouliaceae and Marchantiaceae, by Alexander William Evans. Part 3 of Volume 24, continuing the family Fabaceae of the order Rosales and written by Per Axel Rydberg, was published July 16.

The 1923 dahlia border was planted June 11 and 12. It consists at the date of writing (Aug. 8) of 854 plants, representing 448 varieties. Eight weeks of very dry weather followed the planting, quite the opposite of what happened in 1922. Attacks of the common stalk-borer (*Papaipema nitela*), which in previous seasons have been so few as to be almost negligible, have been numerous and troublesome. However, the plants in general have a healthy appearance and with expected rains the season's dahlia display may yet equal that of other years. Previous contributors of roots and plants have continued their support of the collection, which will include the best 1923 novelties of Broomall, Meachen and Sherman, Waite, Jost, Slocombe, Vincent, Stewart and Fisher, Greinberg, Mills, and others.

At a joint meeting of the Torrey Botanical Club, the New York Bird and Tree Club, the American Fern Society, and the Wild Flower Preservation Society of America, held at the Brooklyn Botanic Garden on May 23, a committee was appointed to consider the possibilities of drafting a law for the preservation of the native flora in the state of New York. Dr. Ralph C. Benedict, resident investigator at the Brooklyn Botanic Garden, who had addressed the meeting on "Game Laws for Ferns and Wild Flowers," was made chairman of this committee. Other members are Dr. Homer D. House, State Botanist, representing the Wild Flower Preservation Society; Dr. G. Clyde Fisher of the American Museum of Natural History, representing the New York Bird and Tree Club; Dr.

Marshall A. Howe of the New York Botanical Garden, representing the Torrey Botanical Club; and Augustus O. Bourn, Jr., a member of the Torrey Botanical Club, who will act as legal adviser.

For several years past the dwarf pines have suffered so severely from attacks of the pine-shoot moth (*Evetria buoliana*) that it was feared that they might have to be removed entirely from the collections. During the past two seasons, however, this pine (*Pinus Mughus*) has shown a decided improvement and many of the plants seem to be making a normal growth. Whether this is due to the appearance of some new natural enemy of the insect or to other causes it is difficult to say. Last season attacks of what appeared to be the same insect were noted in the plantation of red pines (*Pinus resinosa*). The determination of the insect was later confirmed by the State Entomologist who reported that so far as he knew the red pine was not particularly susceptible to attacks by this insect. The insect continues to work in the red pine infecting the young shoots and preventing them from developing. The progress of the work is being followed with interest and it is hoped that this attack will also subside as in the case of the dwarf pines. Very little can be done in the way of artificial control since the insect works under cover where it is difficult to reach. Hand picking is effective but the time required renders this means of control rather impractical.

Meteorology for July. The total precipitation for the month was 1.73 inches. The maximum temperatures recorded for each week were 88.5° on the 5th, 94° on the 10th, *100.5° on the 21st* and 86° on the 25th and on the 26th. The minimum temperatures were 57.5° on the 7th and on the 8th, *57° on the 9th*, 58° on the 20th and *57° on the 24th*.

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Annual members may become life Members by the payment of a fee of $250.00.

Information

Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

Form of Bequest

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....

Vol. XXIV September, 1923 No. 285

JOURNAL

OF

The New York Botanical Garden

EDITOR

H. A. GLEASON

Assistant Director

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

VOL. XXIV September, 1923 No. 285

DAHLIAS AND THEIR CULTURE[1]

The dahlia, as most of you well know, is an ornamental plant that during the past few years has undergone a marvelous development, and has made remarkable strides in the winning of popular favor. In our Atlantic seaboard states at least and on our Pacific Coast, the dahlia has already arrived. In the autumn and in late summer it adorns the farmyard and the garden of the villager as well as the spacious country estate of the multi-millionaire. When you hear some one say that he does not care much for dahlias, you generally find on inquiry that he does not know what modern dahlias are like. To him the word dahlia commonly calls to mind the rather small, stiff, formal, ball-shaped flowers, such as his mother or grandmother used to raise, 30, 40, or 50 years ago. These are still raised and they are preferred by some but there are now whole groups and classes of dahlias that are so very different from the old-fashioned kind that many people do not recognize them as dahlias at all. I well remember my own surprise and astonishment on my first sight of a cactus dahlia. That was less than twenty years ago. I had supposed that I knew a dahlia when I saw one, but I had to ask what this thing was and was greatly taken back when told that it was a dahlia.

The present rapidly increasing popularity of dahlias is apparently due to the ease with which they may be grown, to the wondrous beauty and variety of their flowers, both as to form and color, and to the fact that, under favorable conditions, the

[1] The text of one of a series of garden talks by members of the staff of The New York Botanical Garden, broadcast by WEAF (American Telephone and Telegraph Co.), May 2, 1923, 11 a. m.

earlier and freer-flowering varieties may be depended upon to furnish flowers for a period of about three months, beginning, perhaps, by the middle of July and continuing until the arrival of the killing frosts in October and November. They are, however, essentially autumn-flowering plants and are at their best after the days and nights get cool, in September and October. The glories of daffodils, tulips, peonies, irises, rhododendrons, and gladioli are most striking and are not at all to be despised, but they are short-lived as compared with those of dahlias.

The chief failings of dahlias, if failings they are, would seem to be their lack of perfume and the fact that the roots in our latitude must ordinarily be brought in for the winter and put out again in the spring. In this connection it may be remarked that varieties whose flowers sometimes at least exhale an agreeable odor have appeared upon the market, and that in our southern states and on our Pacific Coast it is not unusual for growers to leave the roots in the ground through the winter, lifting them and separating them just before planting time in the spring.

That there are many varieties of dahlias now in cultivation in the United States is manifest from the catalogues of the larger commercial growers and is manifest also to any one who visits the dahlia shows held each autumn in New York, San Francisco, New Haven, Trenton, and other centers of dahlia interest. Professor Norton of Maryland is compiling a card index to all the published names of dahlia varieties—an index which already has, I understand, more than 10,000 entries. Of these 10,000, past and present, more than 5,000 different varieties are now being grown in this country. Some of these are distinguished, it is true, only by careful comparison, yet the fact remains that several thousand perfectly distinct varieties are now in cultivation. Most of these are supposed to be descendants of a few plants that were grown in the Royal Gardens of Madrid about one hundred and thirty-three years ago from seeds that were sent there in 1789 from Mexico, the native home of most of the species of dahlia. The Abbé Cavanilles, Director of the Royal Gardens of Madrid, named the new plant *Dahlia* in honor of Andreas Dahl, a well-known Swedish botanist of that period. The dahlias, as they grow wild in the mountains of Mexico, occur with single or rarely semi-double flowers, mostly in various

shades of red or pink. The large double flowers and the marvelous colors and combinations of colors seen in the dahlias of today are modern developments. But a blue dahlia, like a blue rose, is something for the future, if it is ever attained. The nearest that we now come to it is a violet purple.

Dahlias were introduced into the ornamental gardens of the United States about one hundred years ago, but their great

COLLARETTE DAHLIA, MME. E. POIRIER

(Photographed at The New York Botanical Garden. Cut used by courtesy of the New Jersey Agricultural Experiment Stations.)

development as to form, size, and color and as to popularity has been during the last twenty years.

The dahlia belongs to the family known to botanists as the Compositae or more recently as the Carduaceae. It is a characteristic of this family that what is popularly called a "flower" is in reality, like the sunflower, a flower-cluster or head, made up

of numerous, closely aggregated flowers or florets, the corollas of which are often developed in two or more ways. In the so-called single dahlias, a few outer flowers of the cluster have broad, flat, conspicuous, expanded corollas, known as the rays, popularly but not botanically the "petals," while the inner or disc flowers, including most of the flowers of the cluster, have small, inconspicuous, tubular corollas. But in our talk today we shall continue to use the word "flower" in its popular sense, meaning what botanists would call a "head" or "flower-cluster."

Growers and exhibitors of dahlias recognize several different classes or groups, based on the form and other characters of the flower or head. The extremes of form are very pronounced and it is usually easy to say into what class a flower is to be placed, but here, as elsewhere in nature, and more especially where nature has been interfered with by man, the lines of separation are not always hard and fast, and it sometimes happens that a variety may be found under two and sometimes three different headings in catalogues of different dealers. As defined by the American Dahlia Society, seven principal classes of dahlias are recognized, but two of them are subdivided and the subdivisions are given equal rank with the main division in most of the catalogues, so we may as well say that there are ten classes—the Single, the Collarette, the Duplex, the Peony-flowered, the Cactus, the Hybrid Cactus, the Decorative, the Show, the Hybrid Show, and the Pompon. It is going to be difficult to give a good idea of these ten classes without being able to show you flowers or lantern-slide photographs of the flowers, but, if you will kindly be indulgent, I will try to do it very briefly and as clearly as is possible under the circumstances.

1. In the class known as the *Single* dahlias, we have open-centered flowers, with 8 to 12, usually 8 rays in a single circle or series. Examples, Twentieth Century and Newport Wonder.

2. In the *Collarette* class, we have flowers of the single type, with not more than 9 large floral rays, but with a circle of smaller, narrower, often differently colored rays, standing in front of or at the base of the larger rays and forming a sort of collar between them and the open center. Examples, Madame Poirier and San Mateo Star.

3. In the *Duplex* class, we find semi-double flowers, with more than 12 rays in more than one circle, the rays long and flat or broad and rounded, not noticeably curled. Examples, Weber and Madame J. Coissard.

4. In the *Peony-flowered* class, we have semi-double flowers, with open centers, the inner floral rays being usually curled or twisted. Examples, Geisha, Laura Barnes, and Caecilia.

5. In the *Cactus* class, we find flowers that are fully double, at least in the early part of the season or in all except the latest

CACTUS DAHLIA, COUNTESS OF LONSDALE

(Photographed at Pleasantville, New York. Cut used by courtesy of the New Jersey Agricultural Experiment Stations.)

stages of development of the individual flower. In the true or fluted type, the rays are long, narrow, straight, incurved or twisted, with sharp or fluted points and with margins rolled backward or outward, forming in the outer florets a more or less perfect tube for more than half the length of the ray. Examples, Countess of Lonsdale, Pierrot, and F. W. Fellowes.

6. In the *Hybrid Cactus* group, we find rays that are short and broad as compared with those of the true cactus, the margins of the rays are only slightly rolled backward, and the tubes of the

florets are less than half the length of the ray. Examples, Kalif, Lady Helen, and Gladys Sherwood. The word "hybrid" in such terms as Hybrid Cactus has no special reference to their mode of origin. Virtually all of the cultivated dahlias are hybrids or crosses of native species or at least of other garden varieties. The expression Hybrid Cactus simply means that the flower is intermediate in character between the true Cactus type and the Decorative type or perhaps the Peony-flowered type.

7. In the *Decorative* class, we have double flowers, normally full to the center and flat rather than ball-shaped, with broad, flat rays, the margins of the outer rays plane or only slightly recurved. Examples, Beatrice Slocombe, Snowdrift, and Judge Marean.

8. In the *Show* class, we find fully double flowers that are globular rather than flat and rays that are quilled or cup-shaped by the folding inward of their margins. Examples, Dreer's White, A. D. Livoni, W. W. Rawson, and King of Shows.

9. In the *Hybrid Show* group, we have flowers that are intermediate in character between the Shows and the Decoratives. They are more loosely built than the Shows, the rays are broader and less cupped or quilled. Examples, Arthur Kelsey and D. M. Moore.

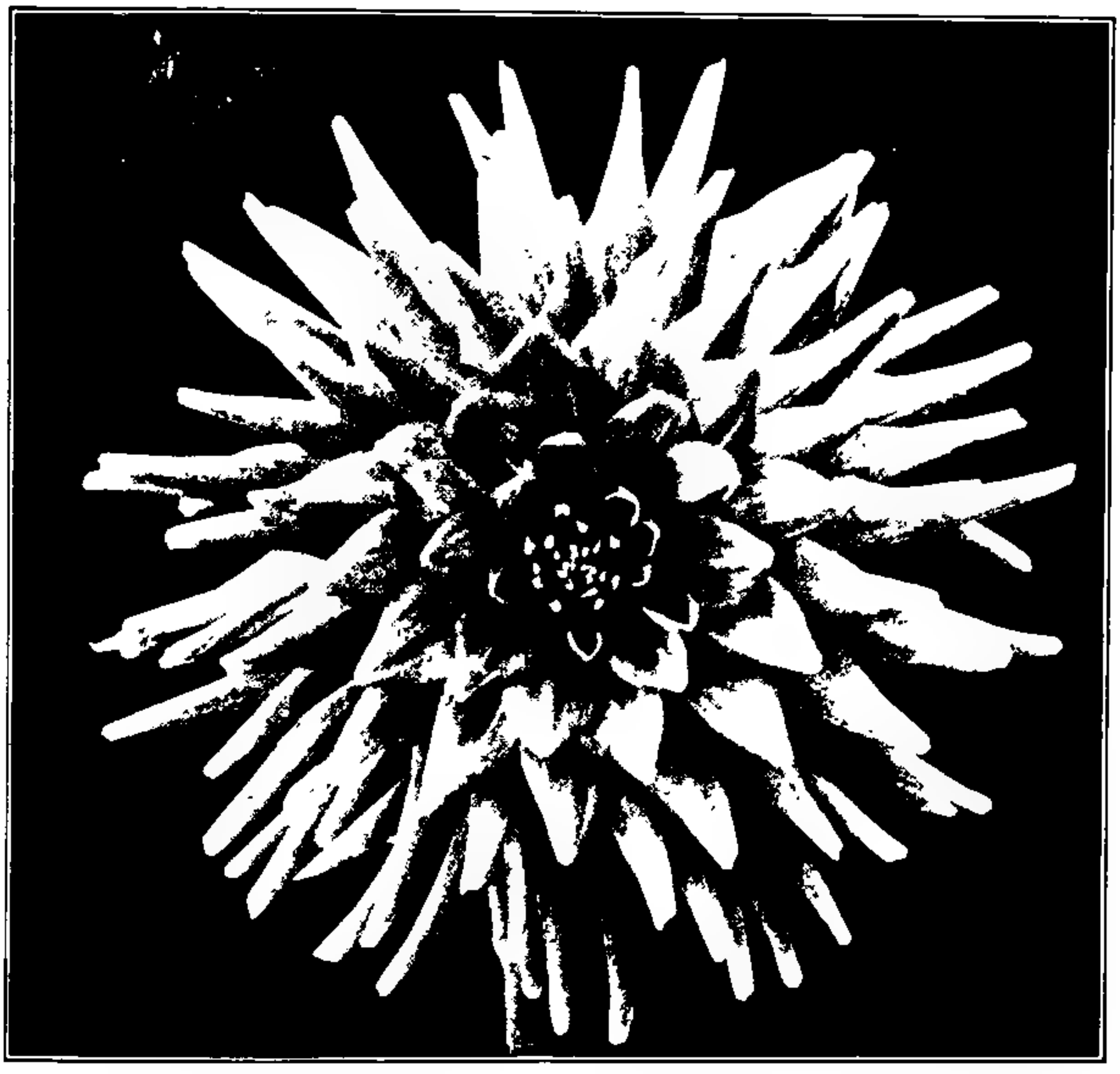
10. In the *Pompon* class, we have flowers of the same general character as in the Shows and Hybrid Shows, but they are smaller—are less than 2 inches in diameter according to the rules of the American Dahlia Society. Examples, Belle of Springfield, Nerissa, and Eileene.

The so-called Show dahlias got that name from their popularity, especially in England, 50 or 75 years ago, when they were thought to be the only form that was really worthy of exhibition.

The Cactus dahlias got that name because the scarlet or crimson flowers of the first known variety of that type suggested to some one in England a resemblance to the flowers of a member of the cactus family that was then popular in the greenhouses of that country.

In the matter of soil for growing dahlias successfully it has been found that a light loam, with good drainage, is most favorable. They commonly do better on a slope than on level land. Dahlias

need plenty of water after they begin to blossom, but, like roses and peonies, they seem to resent standing in places where their feet are continuously wet. A very rich soil sometimes gives a rank growth of stalks and foliage, with few flowers, but generally speaking, there is little danger of making the soil too rich. As a fertilizer, sheep manure and bone meal are especially recommended by many dahlia-growers, but one can get the same chemical elements of plant food from other manures and fertilizers, sometimes more cheaply and more directly. To get the best results, all of these manures and fertilizers should be well mixed with the soil and if one is planting only a few and can take the time and trouble it is well to put most of it about a



CACTUS DAHLIA, CALIFORNIA BEAUTY

(Photographed at The New York Botanical Garden.)

foot away from the root at the time of planting. Manuring "in the hill" is often injurious. If the soil is tolerably good, the plant will make a better start without such manuring. The plant seems to prefer to have most of its food later in life and to have it administered from the surface of the soil. Applications of liquid manure, a surface mulch of manure, or chemical fertilizers applied sparingly and raked into the soil, all after the plants reach flowering size, with artificial watering, if necessary, induce a rapid growth and assist in the formation of large, handsome flowers. But the roots of strongly forced plants sometimes give poor results the following season and roots of moderately fed field-grown plants are to be preferred.

A heavy, clayey soil that is inclined to bake down hard in the summer is often much improved by dumping on sand or even coal ashes to the depth of three or six inches and ploughing or spading it under and mixing it in. Neither sand nor coal ashes adds much to the plant food in the soil but they may improve the mechanical texture, making the soil more porous, and, strange as it may seem, enabling it to hold moisture longer. Of course, if ashes or sand is added, one should increase the fertilizer or plant food accordingly. If one's soil is poor and if stable manures are not obtainable, it is a good plan to buy chemical fertilizers. If one does this, it is much more economical and satisfactory to get the three really important elements rather than to buy the ready-made fertilizer mixtures that contain a lot of inert substances that are of no particular use. The three important things are Acid Phosphate, Muriate of Potash, and Nitrate of Soda. Of the Acid Phosphate and Muriate of Potash, one may use eight pounds of each to a square rod, turning it under by ploughing or spading. The Nitrate of Soda may be spread on the surface and raked into the soil after the plants begin to blossom, using two pounds to a square rod. Nitrate of Soda is very powerful and should be used with caution and restraint, if at all, and should not be placed within a few inches of the plant itself.

Dahlias, as a rule, do best in a sunny location, though some of the varieties welcome a little shade in the middle of the day. The vicinity of trees, shrubs, and woody vines is to be avoided on account of the heavy drain that such strong-growing organ-

isms always make on the food and water content of the adjacent soil.

As to the best time for planting, there are differences of opinion. Something of course depends on one's location and the length of the growing season. In the interior and among the mountains, where frosts are expected in September, it is well to plant

HYBRID CACTUS DAHLIA, MRS. WARNAAR

(Photographed at The New York Botanical Garden.)

as early in May as is consistent with safety from freezing or even to start the roots under glass. But along the seaboard of New York, New Jersey, and Connecticut, where dahlias often bloom into November, later planting is now commonly believed to give the best general results. In such localities, the first week in June is perhaps the most popular date for planting,

though growers for the cut-flower market in New York often prefer to plant later, continuing up to the middle of July. By late planting one of course does not get flowers so soon, but is likely to get more and better flowers when they do come.

For the growing of dahlias, amateurs commonly use either tuberous roots or seeds, although professionals or the more experienced amateurs make use also of green plants grown from cuttings. Unless you have a greenhouse and can root the cuttings in March or April, it is hardly worth while to bother with them. Dahlia roots are often spoken of as tubers or bulbs, but, strictly speaking, they are neither. They are tuberous roots and we shall refer to them as the roots. Wherever you are, it is time now [May 2] to overhaul your dahlia roots, if you have not already done so. Those that look all right and are beginning to show eyes or sprouts may perhaps be returned to the places of storage until the best time for planting in your locality arrives. The root-clumps that are of doubtful vitality should be covered with moist earth or sand and kept in a well-lighted, moderately warm place, at least until you are convinced as to whether they are alive or not. When the eyes are well started, you can then divide the clump in such a way that each division has at least one good eye. Beginners sometimes make the mistake of planting a whole clump without division, but this is not only a wicked waste of roots, but the results are not so good as when the clump is properly divided. One shoot is all that is needed for growing and that may be obtained as well from a single root as from a whole cluster of roots. The beginner should remember that no shoot ever grows from the tuberous root itself. All of the eyes are on the crown of the clump, the crown being essentially the base of last year's stalk. A modern dahlia is the result of a great many crosses or hybridizations and when one plants a seed one never knows just what one is going to get except that it is going to be a dahlia and not a sunflower or a cabbage. The flower of a plant grown from a seed may show more or less resemblance to the flower of the plant from which the seed was taken, it may strike back to one of its numerous ancestors, or it may represent a new blend of the qualities of the mother plant with those of some other variety that stood near it in the field. The new varieties originate from the planting of seeds. When,

however, you plant a root or set out a green plant that has come from a slip, you are, in a way, continuing an individual plant from one season into the next. If this is kept up indefinitely, it is a sort of immortality for a single individual. Except for slight variations due to changes of soil or of climate or perhaps to disease, the flowers under such conditions remain true to type.

If one is planting only a few and wants to do it right, it is well to dig a hole a foot or two deep and see to it that the future plant has good, fertile soil underneath it. Lay the root or division on its side, with the eye or sprout upwards, about six inches below the general surface, and cover at first with about two inches of soil, later drawing in more soil about the plant as it grows, leaving the surface finally level or a bit concave for efficiency in future watering. Don't let more than one or two shoots grow, though it is sometimes prudent to leave more than that until danger from cutworms and stem-borers is passed. A good general working rule is to plant three feet apart, each way, though vigorous, well-nourished plants do better and are more approachable if the rows are four feet apart.

Hot, dry weather is perhaps the chief enemy of the dahlia and for that reason they commonly do better near the seacoast than in the interior of our country. Dahlias ordinarily require little artificial watering until they have reached flowering size and then they commonly need plenty of it. It is much better to soak the ground twice a week to a depth of a foot or two than to water a little every day. It is an excellent rule to be free with the hoe in the early part of the season and to be free with the water after the plants begin to blossom.

Most people who raise only a few dahlias tie them up to stakes to lessen possible injuries from wind and rain. If this is to be done, it is well to drive the stake just before planting. Some varieties are naturally short and others are just as naturally tall. For the taller kinds a standard size of stake is 6 feet long and 1¼ inches square. If the stakes are kept painted and if the bottoms are dipped in creosote oil, they will last for many years.

Some dahlia growers prefer to keep their plants low and shrubby by snipping off the top of the young stem above the second pair of leaves. Instead of one main trunk we then usually have four lateral branches that take its place. This

beheading operation retards the opening of the first flowers by about two weeks. The crown bud—the bud that terminates the main stem or a main branch—commonly makes the best flower and its size and beauty are enhanced if the lateral buds coming from the bases of the three, four, or five pairs of leaves below it are removed about as soon as they start. This allows

DECORATIVE DAHLIA, SNOWDRIFT
(Photographed at The New York Botanical Garden.)

the whole strength of the main stem or main branch to go to the perfection of the one flower. Whether you should practice disbudding or not is largely a matter of taste. It all depends upon whether you want many and smaller flowers or fewer, larger, and, as most people think, handsomer flowers. In the early part of the season most of us dislike to disbud, feeling that

in so doing we are sacrificing many future flowers, but as the season advances and the day of the first frost approaches, we do it with a clearer conscience, feeling that the buds we are removing would be likely to be caught by the frost before they would have a chance to open. Withered flowers should be removed, both to improve the appearance of the plant and to conserve the vigor of the plant by removing the necessity of ripening seeds, that is, unless you wish to ripen seeds and save them for next year's planting. But, as I have already said, you do not know what you are going to get when you plant a dahlia seed except that it is going to be a dahlia, and unless you have plenty of ground, a taste for experimentation, or an overwhelming desire to originate a new variety of commanding merit, it is better to stick to the tuberous roots or to green plants grown from slips. If, however, you are interested in the fascinating game of producing new varieties of dahlias, don't think you have a world-beater and don't put it on the market until you have sent roots of it to the Trial Grounds of the American Dahlia Society at Storrs, Conn., or College Park, Maryland, until representatives of the American Dahlia Society have tested it out, have compared its flowers with those of related varieties, have rated it, and have perhaps given the new variety a "certificate of merit." Although the new varieties of the last five or ten years have added much to the increasing popularity of dahlias, the fact remains that too many new ones, often no better than cheaper pre-existing varieties, are now being offered for sale.

Dahlias, we have said, are easily grown, but it must be admitted that they have their diseases, like other organisms. Most important among these is a mysterious trouble known as the stunt or dwarf disease, which may not be really different from what is sometimes known as the "mosaic" disease. The plant does not develop normally, it remains short or becomes abnormally bushy, and the flowers are few, poorly formed, and undersized. Investigation of the roots often shows small brownish cracks in the skin of the crown, the necks of the roots, or the roots themselves. The cause of this trouble is not certainly known, but, whatever the cause, it is handed down from one season to the next in the tuberous roots and also a little less often in plants that are grown from slips taken from diseased

plants. Roots from plants suspected of disease should never be planted unless one wants to perform a scientific experiment, and in that case do not plant them near your healthy stock, for the trouble seems to be contagious. From certain experiments that have been made and from what is known of similar diseases in other plants, it seems probable that the disease is carried from

DECORATIVE DAHLIA, HORTULANUS FIET

(Photographed at The New York Botanical Garden. Cut used by courtesy of the New Jersey Agricultural Experiment Stations.)

sick plants to healthy ones by small sucking insects such as plant lice and leafhoppers. The common leafhopper, which is sometimes called the white fly, though different from the true white fly of the greenhouses, is especially the object of suspicion. The adults are about one-eighth of an inch long and are yellowish

white or greenish white. When newly hatched, they are much smaller, have no wings, and are usually found close to the veins on the under sides of the leaves. As they feed by pushing their little bills through the skin of the leaf into the juicy interior, they cannot be killed by stomach poisons spread on the surface of the leaf. The only way to get them is by contact poisons, such as the various nicotine sulphate preparations, and these are of no use unless they actually hit the insect. If the leaves are sprayed with Black Leaf 40, X–L All, or some other nicotine sulphate preparation once a week, beginning about June 25 and continuing until September 1, and giving special attention to the lower surfaces of the leaves, the little pests and probably also the spread of the disease may be held in check. But when you feel confident that a plant is diseased pull it out and burn it. Don't coddle it along, with the usually vain hope that its progeny of another season may be stronger. The solution of the mosaic disease problem seems to be to get healthy stock and to keep it healthy by suppressing the small sucking insects.

A usually less serious enemy of the dahlia is the stem-borer, a worm about an inch long that enters the stalk from the outside and eats the interior of the stem. Its presence is usually betrayed by the wilting of the upper part of the stem. The most direct and practical relief is to fish out the worm with a slender wire, hooked at the end. One can usually do this without serious injury to the plant by reaming out the hole by which the worm entered or by cutting off the top of the stem, thus making a suitable opening through which one may introduce the slender flexible wire. If one has only a few plants and is willing to take the necessary trouble, one may usually protect them from both cutworms and stem-borers by surrounding the base of the young plant with a cuff of tarred paper, more or less anointed with some sort of "tangle-foot."

In the late autumn, very soon after the plants are killed by frost, the roots should be carefully lifted and stored away for the winter. If they are left long in the ground there is not only the danger of a real freeze that might damage the roots, but there is also a danger of a warm spell of weather that might start new shoots and thus draw out nourishment that you would rather have remain in the roots for use the next spring. The

beginner should remember that a root with a broken neck is commonly useless and that, accordingly, much care should be used in lifting the clump. Sometimes two men working together, putting in their spades or spading forks on opposite sides of the

DECORATIVE DAHLIA, KING OF THE AUTUMN

(Photographed at Pleasantville, New York.)

clump and lifting together, can operate with less damage to the roots than one man working alone. Cuts and bruises are to be avoided, as they give rot-producing fungi a better chance for attack. Any cuts should be covered with powdered sulphur.

It is desirable to let the lifted roots dry off in the sunshine for two or three hours to remove any excess of sap or moisture from the pith or hollow of the stump, as this fluid, if left, might prove a culture medium for the spores of moulds or other fungi. Many dahlia experts, in packing away their clumps of dahlia roots, turn the stump downward, so that any excess moisture may drain out. As a place for storing roots, any cellar must be tried out before it is quite safe to say just how it will work. If one has a special vegetable cellar where the temperature can be regulated and can be kept a few degrees above freezing most of the time without ever dropping to the freezing point and where potatoes and apples keep well, dahlia roots also, as a rule, may be kept without any special attention as to covering. But the air in an ordinary furnace-heated cellar or basement is too hot and too dry for the proper preservation of dahlia roots unless they are covered in some way. The ideal covering is sifted sand. This rattles down into all the cavities among the roots and at the same time there are minute air-spaces among the grains of sand, so that the roots are not altogether smothered. If sand is not easily obtainable, ordinary soil, preferably sandy soil, may be used, or sifted coal ashes commonly do very well. From ashes the roots sometimes come out in the spring more or less shrivelled, while from sand they usually come out as firm and plump as when they were packed away. One may often get good results by wrapping the clumps in newspapers and then storing them away in boxes and barrels. One should strike the happy medium between too much covering and too little and just what that happy medium is, may best be determined by experience with one's own cellar. The boxes or barrels containing the roots should be placed as far away from the furnace as is consistent with safety from freezing. Moulding and rotting of the crown is often prevented by filling the hollow of the stump with sulphur or at least sprinkling all the cut surfaces of the stump with sulphur. Many people shorten the stump after digging by cutting it off again close to the crown.

Dahlia roots of the numerous varieties are selling at the present time at prices ranging all the way from fifteen cents to fifty dollars a root. But one can make an excellent selection at prices ranging from fifteen cents to a dollar. The older, more

widely distributed varieties are naturally the cheaper. The fact that a variety is an old one is in itself an indication that it has some virtues, as in the case of an old book that is still sold. It is an indication also that the variety is resistant to disease and that the roots winter well.

Among the older, cheaper, Peony-flowered varieties may be mentioned Geisha, scarlet and gold; Madonna, white; and Cream King, cream-colored. Of the newer Peony-flowered dahlias, we

POMPON DAHLIA, BELLE OF SPRINGFIELD

(Photographed at The New York Botanical Garden. Cut used by courtesy of the New Jersey Agricultural Experiment Stations.)

may mention Shantung, red and gold; Pearl Ruggles, carmine-rose; and Uncle Sam, orange-buff, one of the largest-flowered varieties grown.

Old, cheap, and excellent varieties of the Cactus and Hybrid Cactus classes are Countess of Lonsdale, which is salmon-pink and a very free bloomer; Standard Bearer, scarlet; Sherlock,

orange; Pierrot, amber with whitish tips; F. W. Fellowes, orange; Nibelungenhort, old rose; Marguerite Bouchon, pink and white; Kalif, scarlet; George Walters, salmon-pink; Mrs. Warnaar, white or apple-blossom pink; Attraction, lavender-rose; Tom Lundy, carmine-red; and Helen Durnbaugh, blush-pink.

Of the Decorative type some of the excellent, older, well-established, cheaper varieties are Minnie Burgle, dark scarlet; King of the Autumn, buff-yellow or terra-cotta; Souvenir de Gustave Doazon, red; Hortulanus Fiet, shrimp-pink; and Jeanne Charmet, lilac-pink and white.

Of the newer and somewhat higher-priced Decoratives, without, however, mentioning any of the fine novelties of the last season, we might name Snowdrift, pure white, which won a prize last year as the "best flower in the show" in the annual exhibition of the Bergen Co. (N. J.) Dahlia Society; Judge Marean, salmon-pink, orange, and gold, a profuse and early bloomer; Earle Williams, crimson and white; Mrs. Carl Salbach, lavender-pink; The Grizzly, dark velvety maroon; The Millionaire, a faint lavender-pink, a variety that often wins prizes for size of flower; Insulinde. orange, gold, and brown, sometimes a prize-winner for "the most artistic dahlia"; The U. S. A., deep orange; Mrs. I. de Ver Warner, a deep mauve-pink; Rosa Nell, lavender-pink; Cambria, pink and white; Le Toréador, flaming red; Beatrice Slocombe, orange and gold; Bonnie Brae, rose and cream; Amun Ra, burnt orange and copper-colored; and Emily D. Renwick, iridescent-rose.

Of the newer and somewhat higher-priced varieties of the Cactus and Hybrid Cactus classes, without mentioning the promising novelties of the last season, we might name Gladys Sherwood, large and pure white, which the judges pronounced "the most beautiful dahlia" in last year's show of the Short Hills Garden Club, in New Jersey; Lady Helen, pink and cream, often a prize-winner in its class; Dorothy Durnbaugh, lavender-pink; Mrs. Ethel F. T. Smith, a light cream-yellow; and Edith Slocombe, a beautiful garnet-purple.

MARSHALL A. HOWE.

BOTANY OF PORTO RICO AND THE VIRGIN ISLANDS

The appearance on August 10 of the first part of the "Botany of Porto Rico and the Virgin Islands" marks an important step in the publication of the results of the "Scientific Survey of Porto Rico and the Virgin Islands," of which series this botanical treatise constitutes Part 1 of Volume 5. This first part, of 158 pages, includes a preface by Dr. N. L. Britton and the beginning of the Descriptive Flora by Dr. Britton and Mr. Percy Wilson. It carries the treatment of the Monocotyledons into the Amaryllis Family, the principal groups included being the Grass Family (Poaceae), the Sedge Family (Cyperaceae), the Palm Family (Arecaceae), the Arum Family (Araceae), and the Pine-apple Family (Bromeliaceae). A few species are described as new, but most of the novelties had already been published by Dr. Britton and others in previous papers. Part 2 of the Botany is already in press and other parts carrying this botanical work to completion are expected to follow with little delay.

The scientific survey of Porto Rico and the Virgin Islands was begun in 1913 under the direction of a committee of the New York Academy of Sciences, with the support and cooperation of The American Museum of Natural History, The New York Botanical Garden, and some of the scientific departments of Columbia University and of other institutions. The Porto Rico Government has assisted the enterprises by substantial appropriations of money and the two agricultural experiment stations of Porto Rico, one at Mayagüez and the other at Rio Piedras, have also coöperated. Volume 1 of the scientific results of the survey appeared in four parts. Part 1 (1919) includes a "History of the Survey" by Dr. N. L. Britton, an "Introduction to the Geology of Porto Rico" by Professor Charles P. Berkey, a "New Base Map of Porto Rico" by Dr. Chester A. Reeds and A. Briesemaster, and "The Geology of the San Juan District" by Dr. Douglas R. Semmes; Part 2 (1920), consists of "The Geology of the Coamo-Guayama District" by Dr. Edwin T. Hodge; Part 3 (1922) contains "Geology of the Ponce District" by Dr. Graham J. Mitchell; and Part 4 (1922) comprises "The Physiography of Porto Rico" by Dr. Armin K. Lobeck. Volume

2, Part 1 (1923) includes "The Geology of the Lares District" by Dr. Bela Hubbard. Volume 3, Part 1 (1920) consists of a paper on "Tertiary Mollusca from Porto Rico" by Dr. Carlotta J. Maury; and Part 1 (1923) comprises a systematic treatment of the "Tertiary Mollusca from the Lares District" by Dr. Bela Hubbard.

MARSHALL A. HOWE.

AN APPRECIATION OF DR. STOUT'S WORK IN CALIFORNIA

At a regular meeting of the Board of Directors of the California Avocado Association held in Los Angeles on June 15, 1923, it was unanimously resolved that the Association express its sincere appreciation of the work of Dr. A. B. Stout of the New York Botanical Garden in connection with the investigation of the pollination of the flowers of the avocado, the board feeling that the final results of the work of Dr. Stout will be of incalculable value to the avocado industry, and it being their fervent hope and desire that it will be the good fortune of the avocado growers to have Dr. Stout continue his good work during the next season of bloom.

It was further resolved that a copy of this resolution be sent to Dr. Stout, and a copy published in the printed proceedings of the Association.

(Signed) J. ELIOT COIT,
President.

NOTES, NEWS AND COMMENT

Dr. W. W. Rowlee, Professor of Botany in Cornell University, died on August 8 in his sixty-second year. He had been especially interested during recent years in the balsa or corkwood (*Ochroma Lagopus* and its relatives). His studies of these light woods, used in the construction of aeroplanes and life-rafts, had taken him to Costa Rica, Nicaragua, Guatemala, and elsewhere in the tropics. He often visited the Botanical Garden to compare specimens and consult literature, and his cheerful presence will be missed by his numerous friends at the Garden.

Dr. Murrill attended the Harding memorial meeting of Girl Scouts near Central Valley on August 10, where all the New York girls from nearby camps were assembled; and he conducted the memorial service at Camp Wachtung for the Girl Scouts from Montclair and the Oranges. While at the Bronx Girl Scout Camp, he made arrangements in consultation with Miss Marjorie Weber, the Director, for the immediate construction of a permanent museum, in which the specimens collected and prepared by the girls can be displayed and books on various phases of nature consulted. The equipment for the Bronx girls will be similar to that already provided for those from Manhattan, Brooklyn, Paterson, and Montclair.

ACCESSIONS

LIBRARY ACCESSIONS FROM APRIL 24 TO AUGUST 20

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CLARKE, JOHN MASON. *James Hall of Albany, geologist and palaeontologist.* Albany, 1923. (Given by the author.)

DEUTSCH, DANIEL LUDEWIG. *Kurze Anweisung zur Maulbeerbaum-Zucht und zum gehdrigen Betrieb des Seidenbaues.* Berlin, 1790. (Given by the Trustees of Princeton University.)

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MUSEUMS AND HERBARIUM

102 specimens of flowering plants from North America. (By exchange with Harvard University.)

1 specimen of a Tertiary plant—*Ranunculus florissantensis* —from Colorado. (Given by Professor T. D. A. Cockerell.)

1 specimen of a Cretaceous plant—*Feistmantillia oblonga.* (By exchange with the United States Geological Survey.)

30 miscellaneous museum specimens. (Given by Dr. H. H. Rusby.)

1000 specimens of ferns and flowering plants from northern South America. (Purchased from the Royal Botanic Gardens, Kew.)

45 specimens of fossil plants from the Mesozoic of Sweden and Greenland. (By exchange with the Riksmuseum, Stockholm, Sweden.)

1700 specimens of spring flowering and flowerless plants from Florida. (Collected by Dr. J. K. Small.)

220 museum specimens from Bolivia and Brazil. (Given by the H. A. Mulford Company.)

51 specimens of flowering plants from southern New Jersey. (Collected by Mr. A. T. Beals.)

960 specimens of summer flowering and flowerless plants from Florida. (Collected by Dr. J. K. Small.)

2300 specimens of flowering and flowerless plants from Bolivia and Brazil. (Given by the H. A. Mulford Company.)

2 specimens of Tertiary plants—*Taxodium occidentale* and *Sequoia Langsdorfii*—from Alaska. (By exchange with the United States Geological Survey.)

3 specimens of *Rosa* from Indiana. (By exchange with Mr. L. F. Heimlich.)

7 specimens of Cretaceous plants from Chijuik River, Alaska. (By exchange with the United States Geological Survey.)

1 specimen of *Centaurea maculosa* from Iowa. (By exchange with Mr. R. I. Cratty.)

22 specimens of flowering plants from Lacombe, Alberta. (By exchange with Mr. R. H. Dixon.)

18 specimens of flowering plants from North Carolina. (Collected by Dr. J. K. Small and Mr. J. W. Small.)

1735 specimens of flowering plants and ferns from Brazil. (By exchange with the British Museum.)

5 specimens of hybrid oaks from Staten Island, New York. (Collected by Dr. Arthur Hollick.)

1800 specimens of flowering plants and ferns from southeastern Virginia. (Collected by Mr. E. Jerome Grimes.)

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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIV October, 1923 No. 286

JOURNAL

OF

The New York Botanical Garden

EDITOR

H. A. GLEASON

Assistant Director

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

Vol. XXIV October, 1923 No. 286

GREEN DESERTS AND DEAD GARDENS

A Record of Exploration in Florida in the Spring of 1921

Floristics follow the Flag! Shall we add that this is not a boast, but a confession? Over half a century ago, while the conquest of the West was in progress, Eastern botanists caught the fever from the pioneers and likewise turned their attention to those sunset trails. Then, so great became the charm of the new and fascinating floras here discovered that the flora of the East was, to a great extent, neglected or forgotten. It was not solely due to the exodus of botanists from the East, however, that the older botany was thrown into this unfortunate desuetude. There was also that general substitution in the East of "closet botany" for the formerly more popular field work. Whatever the causes, the flora and floristics of the Pacific side of the North American Continent are considered by many—and perhaps correctly so—to be generally better known than those of the Atlantic side even today. Nor has this craving for distant conquest lost its hold on some of our present-day botanists, apparently—they are better pleased, like their predecessors of yesterday, to browse among the vast floras of fields afar, than to graze the pastures nearer home!

All this by way of preface. And yet, did not a certain philosopher say many centuries ago. "there are last which shall be first, and there are first which shall be last"? It is a truth applicable not only to the East versus the West, but even more pointedly to the region directly under consideration: Florida. For this, the first part of the mainland of the New World to partake of the white man's civilization has been the last of our states to have its flora thoroughly collected and studied.

In continuation of the elucidation of the wonderful plant-covering of the Peninsular State, Mrs. Small and the writer left New York for Miami about the end of March, 1921. The following outline of exploration and notes, made possible through the interest of Mr. Charles Deering, indicates our activities during about four weeks of field work.

The winter had been comparatively mild, nevertheless vegetation had assumed its usual winter's rest and at the North the landscape was desolate. Lawn-grass had taken on some verdure, but the only green carpets outside of cultivated places were areas whose ground-cover showed fresh as the result of burning—a process that both stimulates new growth and at the same time removes the dead vegetation that might hide it.

The Mason-Dixon Line is, in a way, biological as well as political. Its vicinity is the dividing line between early seasons southward and later seasons northward, in the first half of the year and vice-versa in the second half. Approaching the line, the willows (*Salix*) and the spice-bush (*Benzoin*) in the low places and the elm (*Ulmus*) in the higher ground showed open flowers. The red maple (*Acer rubrum*) was, perhaps, the most conspicuous tree, especially when placed against the darkened background of numerous swamp oaks (*Quercus palustris*). The bleached stalks of the rose-mallow (*Hibiscus Moscheutos*) indicated what appearance the marshes exhibited a half year earlier.

Then the cultivated fruit trees, especially, broke the monotony of the landscape with patches of white, cream, and pink, furnished respectively by the apple (*Malus*), the pear (*Pyrus*), and the peach (*Amygdalus*).

Over the line, green came more and more in evidence, however, by almost imperceptible degrees, until the shrubs and trees showed new foliage in shades of green almost as many as the kinds of plants. The flower-buds, too, of many kinds of wild woody plants appeared ready to burst, particularly those of the dogwood (*Cynoxylon*), the haws (*Crataegus*), the plums (*Prunus*), and blackberries (*Rubus*).

Upon reaching the "Sunny South"—quite literally, for rains had been few and far between for some months before—the outlook was more cheerful. Blooming plants were nearly everywhere, not only native kinds—white violets, blue violets

(*Viola*), white azaleas, pink azaleas (*Azalea*), haws (*Crataegus*), devil's shoestring (*Cracca*), and the dainty vetch (*Vicia acutifolia*) clambering over the massive yellow thistle (*Cirsium horridulum*); but there were coarse and delicate naturalized plants, many of them weeds—docks (*Rumex*), small and large buttercups (*Ranunculus*), cresses (*Barbarea*), and dandelions (*Leontodon*). The cultivated and naturalized trees of the pride-of-China (*Melia Azedarach*) showed curious stages of development: some trees were leafless and flowerless, others leafy and flowerless, still others leafless and floriferous, and still others both leafy and floriferous.

The tall trees (*Nyssa*) in the gum-ponds were decorated with clumps of mistletoe (*Phoradendron*) and festoons of Florida-moss (*Dendropogon*).[1] The water-lily leaves had survived the winter and the plants were in flower. They were usually accompanied by numerous flowering stalks of yellow bladder-worts (*Utricularia*). The wet or usually wet floors of the low hammocks were often covered with a growth of the dwarf-palmetto (*Sabal minor*), the slender blue-flag (*Iris prismatica*), and a white-rayed aster.

Down towards the Georgia-Florida line the hammocks were showy with the drooping white plumes of the fringe-tree (*Chionanthus*), the white bunches of the withe-rod (*Viburnum nudum*), the myriads of flower-clusters of the titi (*Cliftonia*); while among these the fragrance of the pepperbush (*Clethra*) was often quite evident. In the low pinewoods pitcher-plants of different kinds (*Sarracenia minor* and *S. psittacina*) came into view and on the slightly higher land the white or pale-pink atamasco-lily (*Atamosco*) grew in large patches. On still higher elevations other flowering plants were in evidence; two lupines of different groups (*Lupinus Nuttallii* and *L. diffusus*) often growing in company with a very bushy knotweed (*Polygonella*) and the stiff wild-indigo (*Baptisia alba*) may be recorded.

The extensive salt and brackish marshes near the coast and the various inlets, although flowerless, were full of color, *en masse*, according to the vegetation covering the various areas. Thus an area of red was caused by the switch-grass (*Spartina*); or of brown caused by the rush (*Juncus Roemerianus*); or of green caused either by the cat-tail (*Typha*) or by the wild-rice (*Zizania*).

[1] Journal of The New York Botanical Garden **23**: 119; **24**: 425.

Upon reaching the "Gateway-of-Florida"—Jacksonville—we were joined by Dr. Howard A. Kelly of Baltimore. Dr. Kelly participated in our excursions in the peninsula and on the reef and devoted much of his time to the collection of lichens and snakes.

Temporary headquarters were made at Jacksonville, whence several excursions within a radius of thirty-odd miles had been planned for hunting plants, particularly cacti and spider-lilies. However, one short excursion convinced us that it would be futile to spend more time in that region at that time. Although flowers were in evidence in the Carolinas and Georgia, the protracted drought, very severe in Florida, had checked the flowering stages of most of the plants that should have been blooming or fruiting then. Consequently we did not tarry longer in northern Florida, but set out on the "King's Road," a highway built by colonial capitalists in the eighteenth century for traffic between Charleston, South Carolina, and the upper eastern coast of Florida.

From Jacksonville to Miami

A few flowering herbs and shrubs were found, *en route*, between Jacksonville and Saint Augustine. They were more numerous on the lower grounds, or, in other words, nearer the water-table. The swamps, although dry or partly dry, exhibited blue-flags (*Iris*), pipewort (*Eriocaulon*), sneezeweed (*Helenium*), and flea-bane (*Erigeron*). In the lower pinelands the wild sensitive-plant (*Morongia*) was tangled in the dry grass with its myriads of minute leaflets and the small, fluffy, bright rose-purple, globular flower-heads which were minutely gold-spangled by the numerous anthers. Associated with this sprawling plant were two kinds of pawpaws (*Asimina*) with white or creamy flowers, the one with a relatively small stiff corolla, the other with large floppy petals.

Even if the high pinelands were exceedingly dry, they were not wholly flowerless. Two herbs, one a monocotyledon and the other a dicotyledon, both, however, with underground reservoirs of moisture and nutriment stored up against drought, were in flower. The false flypoison (*Tracyanthus*) was scattered and raised its small white plumes of flowers far above its entire narrow grass-like leaves, while the berlandiera, most of whose

relatives are in the Texano-Mexican region, often grows in colonies and was quite showy on account of the yellow patches it formed.

The oak woods were conspicuous both on account of the even growth of the trees—they seemingly having started to grow about the same time—and their freedom from accompanying undergrowth. The frequent fires have too little fuel to harm the trees, but sufficient to prevent young growth from developing.

. . . . . The cypress swamps, with the water at or above the surface, were the places most abounding in flowers. A tall rush (*Juncus*) grew in large clumps, the pipewort (*Eriocaulon*) was conspicuous with its myriads of white buttons, the flea-bane (*Erigeron*) showed its yellowish button-like disks fringed with numerous white or pinkish rays, and the yellow-headed sneezeweed (*Helenium*) was scattered here and there among the other plants.

Several "scrub"-like areas with both high and low land exhibited the habitat preferences of two kinds of pines. The spruce-pine (*Pinus clausa*) grew on the dry elevations—it must have its feet dry—while the black-pine (*Pinus serotina*) occupied the moist depressions—it must have its feet wet.

Although we failed to find coonti (*Zamia umbrosa*)—this plant was one of the objects of our search—we did get a report of its occurrence east of Durbin. The old trails leading to that region were closed, however, and we could not investigate as we had wished to do.

Open areas about Saint Augustine, and even uncut lawns, were often either blue with the flowers of a wild sage (*Salvia lyrata*) or yellow with the corollas of a rock-rose (*Crocanthemum corymbosum*). From Saint Augustine we continued southward on the King's Road, instead of on the Dixie Highway. Little was in bloom; but the low places again showed a majority of flowers—butterwort (*Pinguicula*), bladderwort (*Utricularia*), arrowhead (*Sagittaria*), false-pimpernel (*Ilysanthes*), and floating-heart (*Nymphoides*)—as against the two milkworts (*Polygala nana* and *P. lutea*), in the higher lands.

Plants of coonti (*Zamia*) soon began to appear in yards of houses, and inquiries brought out the information that the plant grew wild between the old settlement of Matanzas and the "Big Water" (Atlantic Ocean), as our African informant put it.

Unfortunately, that region was inaccessible to us at that time.

In this connection it may be interesting to quote what William Baldwin wrote while passing through the nearby coastal region more than a century ago:

"along with a sample of starch, procured from the root of what appears to me to be a species of Palm, growing at Matanzas, 30 miles south of St. Augustine. I shall know more about it shortly."[1] (Written 1817.)

A European plant, the bur-clover (*Medicago hispida*), had taken possession of long stretches on the dry roadsides. As we approached the northern end of the Halifax River region a number of heaths appeared in flower. More prominent among them were dwarf-huckleberry (*Gaylussacia dumosa*), fetterbush (*Desmothamnus nitidus*), staggerbush (*Neopieris Mariana*), and xolisma (*Xolisma fruticosa*).

Examples of the changing of the plant-covering of the State confronted us several times. Large areas that formerly, and at no very remote time, were typical high pineland had had their pine trees removed by lumbering operations or by fire—perhaps by both—and at the same time their characteristic undergrowth had been destroyed. Now, scrub-oaks and other plants characteristic of the "scrub" which was nearby have taken possession. Even a spruce-pine (*Pinus clausa*) appeared here and there. Thus, if fire did not sweep through the e areas and the broad-leaved shrubs and trees should hold their ground, the record of the existence of the one-time high pineland would be lost. It would be interesting to know how many cycles of vegetation the surface of Florida has supported in recent geologic time.

At the settlement of Volusia we left the mainland and crossed the upper end of the Halifax River to the coastal sand-dunes. The dunes are flanked on the east or outside by the Atlantic Ocean where the shore line (barrier-beach) is marked, so far as its floristics is concerned, by a fringe of saw-palmetto (*Serenoa repens*). They are flanked on the west or inside by a lagoon, known as the Halifax River, or by its marshes in which at that time the common-reed (*Phragmites*) was the dominant plant.

Passing southward, the dune-area widens out as an ocean of sand with great parallel undulations, ten or twelve of these rollers of sand sometimes covering a quarter or a half mile. The inside roller or two are often floristically quite different

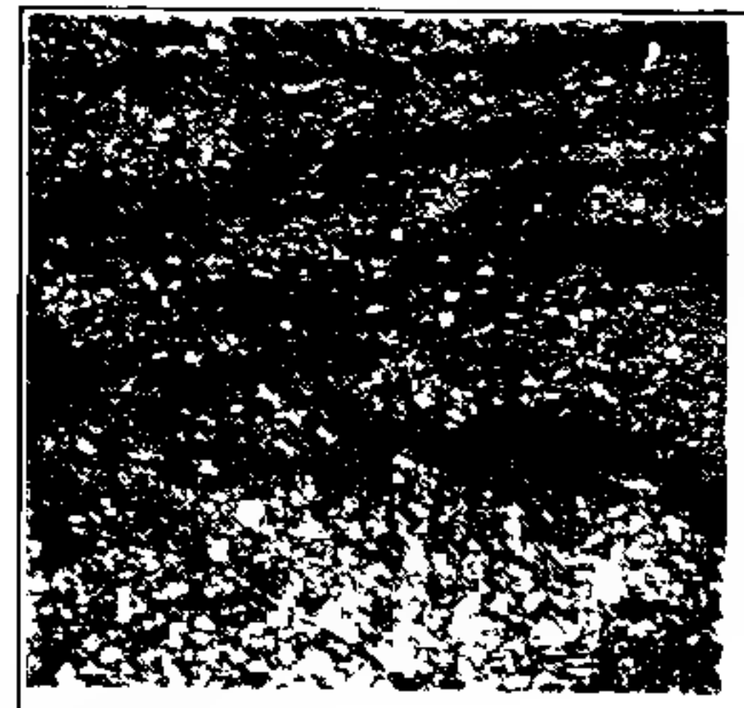
[1] Reliquiae Baldwinianae 218. 1843.

from the others, this difference being, in a way, man-made, rather than a direct result of meteorologic action. It has been transformed into a shell-midden by the Florida aborigines, who covered the original sand foundation with from one to many feet of shells discarded from the oysters and clams which they secured in the lagoon. As a consequence of this difference in the surface of the dunes, two extremes of woody broad-leaved growth or hammock have resulted. On the sand-dunes the several kinds of trees are stunted as a result of a very impoverished soil, which is almost pure silica, and they are further worn down and spread out by the never ceasing action of the winds from the ocean. The growth is a miniature hammock, but it is usually very dense, commonly impenetrable. Mixed with the broad-leaved trees, or forming vast areas by itself, is the saw-palmetto (*Serenoa repens*). The shell-middens present quite a different aspect. Tall hammock prevails there. The better soil and partial protection from the sweeping winds from the outside permit a more normal growth. The saw-palmetto is there and in better form than on the sand-dunes and the palm growth is augmented by the cabbage-tree (*Sabal Palmetto*), which is usually very plentiful.

The advent of spring was evidenced by the two shades of green on the evergreen broad-leaved trees and shrubs. The persistent leaves were dark-green, while the freshly opened light-green ones contrasted strongly with the old ones. Besides the broad-leaved trees there were some red-cedar trees (*Sabina silicicola*), and here and there a pine tree, evidently the progeny of trees on the mainland whose seeds were blown across the lagoon by westerly winds. An occasional naturalized guava (*Psidium Guajava*) in the hammock indicated the tempering effect on the climate of the nearby water. Flowers were scarce or wanting. An occasional shrub of garberia (*Garberia frutescens*), with its clustered heads of almost blue flowers, and patches of the naturalized phlox (*Phlox Drummondii*) enlivened the landscape.

Daytona was achieved about sundown. Early the following morning we hastened on to New Smyrna with the celebrated Turtle Mound as our objective for that day.

One of the early accounts of New Smyrna and its environs may here deserve quoting:



Turtle Mound.—The most celebrated and highest kitchen-midden in America, and one of the very late artificial geologic formations. Its recorded history began early in the 16th century, but many previous centuries were required to build it. The aborigines were active in that region as late as the early part of the 18th century when they suddenly became extinct. The insert shows strata of shells, humus, charcoal, ashes, and bones, indicative of successive occupations. The floristics of the middens are of a type wholly foreign to those of the surrounding country.

"New Smyrna is built on a high shelly bluff [kitchen-midden], on the West bank of the South branch of Musquito river, about ten miles above the capes of that river, which is about thirty miles North of Cape Canaveral, Lat. 28. I was there about ten years ago, when the surveyor run the lines or precincts of the colony, where there was neither habitation nor cleared field. It was then a famous orange grove, the upper or South promontory of a ridge, nearly half a mile wide, and stretching North about forty miles, to the head of the North branch of the Musquito, to where the Tomoko river unites with it, nearly parallel to the sea coast, and not above two miles across to the sea beach. All this ridge was then one entire orange grove, with live oaks, magnolias, palms, red bays, and others: I observed then, near where New Smyrna now stands, a spacious Indian mount and avenue, which stood near the banks of the river: the avenue ran on a strait line back, through the groves, across the ridge, and terminated at the verge of natural savannas and ponds."[1]

The accuracy of William Bartram's reference to the existence of large orange-groves in that region is sometimes questioned. But the fact that they did exist there is supported by the correspondence of William Baldwin written fifty years later, for example:

"The evening proving squally, we were unable to recross Matanza river; and took up our abode for the night, in the ancient and venerable fabric erected by the old Fish, who was the original proprietor of the Island. He was a native of Flatbush, in the State of New York, and made improvements which have hardly been exceeded in any part of the Province. Here are the remains of perhaps the most celebrated Orange Grove in the world. Some trees still remain that are 30 feet in height,—and still retain a portion of their golden fruit. But all is now in ruins. Two generations have passed away."

"From this plantation we again took our land tacks on board, and reached this (Tomoko) river on the evening of the third day,—50 miles southerly of St. Augustine. The land, I find, increases in fertility as we advance south,—the Hammocks more rich and extensive,—and even the Pine land of a better quality. From this place we again took to the water, cruising down Tomoko, in the midst of shoals of alligators, for 3 or 4 miles in a N. easterly direction until we entered Halifax river (a Lagoon, or arm of the sea,)—when we again bore up south, straight as a line could be drawn, 14 miles to the habitation of Mrs. Carr, a widow, on the western shore. Here was a noble

[1] William Bartram, Travels through North and South Carolina, Georgia, East and West Florida. 142. 1792.

spontaneous grove of Orange trees—principally the "bitter sweet" (Seville)—loaded with fruit in high perfection, and at the same time in flower. Here, also, I discovered a species of Myrtus, and a white Blackberry. Recollect, I am only telling you a part of the story. I have seen many other new plants, and fine things, too tedious to mention. The night was spent with the widow; and the following evening we landed safely at the Ruins of New Smyrna,—about 16 miles further south, and the same distance from any settlement.[1] (Written in 1817.)

Furthermore, William Stark, a resident of Florida at about the time of William Bartram's residence there, records that:

"The western banks of the Halifax and Hillsborough rivers contains a great deal of excellent land; the many orange groves, (which denote former Spanish settlements) and the frequent remains of Indian towns, shows that they have been once well inhabited."[2]

Through the interest of Mrs. Henry Berger and Professor Henry C. Beardslee we were soon embarked and headed down Mosquito Lagoon for a survey of Turtle Mound, and as far as we know the first botanical excursion to visit this unique kitchen-midden—a point of interest which has been well known for many generations.

Surruque, printed on a map about the beginning of the sixteenth century, is the oldest name for Turtle Mound. It also has other names—Mount Belvedere (1769), The Rock (1769), Mount Tucker (1796), Turtle Mount (1823).

The governor of Florida in the early part of the sixteenth century was Pedro de Ybarra. He sent one of his soldiers, Alvara Mexia, on a mission among the Indians about the eastern coast of Florida. In his report this is what Mexia records of Turtle Mound:

"The river (south of Caparaca) pursues its way to the southeast, all through Mangrove islands, with sand mounds and palmetto groves and hillocks of low evergreen oaks on its east bank; it makes many turns and twists, and passes at the foot of the mound which they call the mound of Surruque; this is a hill of oyster shells and short grass, and at the foot of the said hill the Indians of Surruque launch the canoes to go to sea."[3]

[1] Reliquiae Baldwinianae 224 and 226. 1843.

[2] An Account of East Florida (Reprint) 13. 1881. Original published in 1765.

[3] Janette Thurber Connor, New Smyrna News, March 25, 1921.

Turtle Mound is built up on the lagoon shore of the barrier dunes. In fact, it arises abruptly to a height said to be eighty feet from the waters of Mosquito Lagoon—the part of it sometimes termed Hillsboro River. It is much longer than wide and covers an area of several acres. About sixty years ago this description of the mound appeared:

"It is thirty feet high [far too moderate an estimate], composed altogether of separate oyster shells, it being rare to find an entire one; there are also some conch and clam shells, both of which, however, are exceedingly scarce. That it is artificial there is no doubt in my mind. Some eight or ten years since we experienced a gale in this section of the country, from the north west, which caused that portion of the mound facing the river, the steepest part, to wash and fall considerably; being there a few days afterward, I took considerable pains to examine the face of it, and found low as the bottom and as high as I could observe, numberless pieces of Indian pottery, and quantities of bones principally of fish, but no human ones, also charcoal and beds of ashes."[1]

The eastern side of the mound has a more gradual slope; the sandy lower slope was doubtless used for a burial ground.

About 1817 Baldwin claims that the mound was covered with grass. Today it supports a hammock. There are over thirty kinds of woody plants and perhaps twice as many herbs on the mound.

The vegetation, although the locality is pretty far north along the coast, is largely of a tropical character—the snowberry (*Chiococca*), butterbough (*Exothea*), torchwood (*Amyris*), marlberry (*Icacorea*), wild-coffee (*Psychotria*), black-mangrove (*Avicennia*), white-mangrove (*Laguncularia*), red-mangrove (*Rhizophora*), and spice-tree (*Anamomis*) were among the more abundant shrubs and trees. Among the herbs of a tropical flavor were the poor-man's patches (*Mentzelia*) and the wild plumbago (*Plumbago scandens*). A broom-grass (*Andropogon*) was not rare. This may have been the grass that covered the mound in Baldwin's time. Even the Papaya (*Carica*) was there in its wild state, evidently brought up the coast by migratory birds. The citrus fruits were represented by the wild orange in all stages of growth, from old trees down to seedlings a year old. The ubiquitous herb near the top of the mound was a usually

[1] D. G. Brinton, Notes on the Floridian Peninsula 78. 1859.

little nettle (*Urtica chamaedryoides*). There it was a widely branching plant growing up to four or five feet tall.

The view from the top of the mound is unique along the Florida coast, both in extent and variety, for it is the highest isolated elevation, and commands a view of the ocean towards the east, the coastal dunes stretching north and south, and the lagoon and the mainland to the west fading away into the distant pinelands.

On a page following the preceding quotation we read:

"Little attention has ever been paid to the natural history of the country [Florida], at least by Americans." (Written in 1859.)

In recent years the title to Turtle Mound is said to have passed through several hands. At the time of our visit it was reported to have become the property of the county, acquired by it as source of road-building material. The fate of this natural garden—with a rich flora almost wholly different from that of surrounding territory for many miles—seemed so surely sealed that we put it in our list of dead gardens. However, a year later we learned that some public-spirited citizens had succeeded in rescuing the mound and intended to preserve it as one of Florida's monuments.

When the day was too far spent for further collecting we returned to Daytona, and the following morning resumed our southward course, by starting out over the coastal sand-dunes towards Mosquito Inlet.

The dunes were more desolate-looking than usual. However, in some places a false-dandelion (*Sitilias*), locally known as lemon-drops, and a butterfly-pea (*Clitoria*) would show themselves, and a flat-topped tree of the wild-olive (*Osmanthus*) or the tallow-wood (*Ximenia*) could be seen. Woody vines, bamboo (*Smilax*) and grape (*Vitis*), both with a deep-seated root system, were rampant. An occasional small patch of open hammock or even a sand-bank was a mass of color, yellow furnished by partridge-pea (*Chamaecrista*) or blue-purple by spiderwort (*Tradescantia*). The scrub-oaks had donned their new greenery, but the tall oak trees were just putting forth their new foliage.

Down towards Mosquito Inlet we found a relic of some of the early settlements of that region—the cherry-laurel (*Laurocerasus Laurocerasus*). It was thoroughly at home in the hammock.

The dunes were green with stunted spice-tree (*Anamomis*), which must constitute a unique sight when in flower. The bark and leaves of this myrtle differ from all our other members of the family in that they taste like nutmeg. Mixed in this formation was an occasional bush of garberia evidently resulting from the seeds with their fluffy pappus blown across from the mainland. A few bushes were in flower, although it was not their proper season for blooming.[1]

Although it is only a stone's-throw across Mosquito Inlet to the continuation of the dunes, we had to double on our route as far north as Port Orange in order to get back to the mainland and then proceed to New Smyrna, whence we crossed the Hillsboro River (Lagoon) to the coastal dunes.

Near Coronado we added another plant to the naturalized flora of Florida by finding the white evening-primrose (*Hartmannia speciosa*) growing on the dunes. This plant is native in the Texano-Mexican region and in an easterly migration through the agencies of man has finally reached the Atlantic coast from South Carolina to Florida.

Our objective was a shell-midden on the shore of Mosquito Lagoon several miles south of Coronado. There we visited the most northern station for the cactus genus *Harrisia*. The next southern station known for the prickly-apple, as *Harrisia* is sometimes called, is at the southern tip of Merritt's Island, opposite Eau Gallie, or a distance of sixty-five miles. Growing with the cactus on the shell mound was the little wild-pepper (*Peperomia cumulicola*). This mound represents the southernmost station for this wild-pepper, which was discovered over a century ago on shell-middens at the mouth of the Saint John's River.[2] Each of our lately discovered new stations for it is on the middens of the aborigines, without exception, with whose manner of living it may have been connected. There are large quantities of this wild-pepper on the shell-middens on the mainland between Daytona and New Smyrna, but this locality is the first known for it on the adjacent coastal dunes.

Associated with the cactus and the wild-pepper were several tropical shrubs and trees, some that also were found on Turtle

[1] For other notes on this region see Journal of The New York Botanical Garden 22: 196–198; **23:** 127–128; **24:** 26–30.

[2] Journal of The New York Botanical Garden 24: 20–21.

Mound. More prominent among them were the torchwood (*Amyris elemifera*), stopper (*Eugenia axillaris*), wild-lime (*Zanthoxylum Fagara*), and a curious form of the snowberry (*Chiococca*) which exhibited the habits of a shrub, a creeper, and a climbing vine.

All these large kitchen-middens—floristically gardens, artificial in a way, comprising species and genera recently introduced into the midst of a different type of plant association—are succumbing one after another. The present one is no exception, for much of the shell material has already been carried away, and most of the prickly-apple and the wild-pepper plants were hanging tops downward by the tips of their roots over the face of the mound that had been cut away.

The air-plants were in evidence by the Florida-moss (*Dendropogon*), and by one of the small wild-pines (*Tillandsia recurvata*). To our great surprise we found a southern tree-orchid or epidendrum (*Encyclia tampensis*) far northward of its hitherto known geographic range. The only other so-called epidendrum that can withstand more cold weather is the little *Auliza conopsea*, a tree-orchid which occurs in the same neighborhood and extends northward as far as southern South Carolina.

The shore and marshy places near this midden abounded in salt-loving plants; at least several kinds were much in evidence, all representing the simpler dicots, except the last one cited in the following list: samphire (*Salicornia*), saltwort (*Batis*), sea-blite (*Dondia*), beach-carpet (*Philoxerus*), sea-purslane (*Sesuvium*), marsh-hyssop (*Bramia*).

About a rather recently abandoned settlement the growth of both wild and cultivated plants was rank. Several exotics had established themselves in the hammock and were spreading, one a large-fruited mulberry (*Morus nigra*), commonly cultivated in Florida for its fruits, and another the hare's-ear (*Conringia orientalis*), a flower-garden plant, and a mustard relative. The trees of the lucky-nut (*Cerbera Thevetia*) and the fig (*Ficus Carica*), formerly planted about an old dwelling, were maintaining themselves with exceptional luxuriance and spreading into the hammock.

Upon returning to the mainland we hastened southward and at Oak Hill we again left the Dixie Highway and ran down a narrow peninsula which terminates in the head of the Indian

River at a settlement called Allenhurst, where the Coastwise Canal connects the Indian River with Mosquito Lagoon. A result of the drought was a rather scant exhibition of native flowers. However, the red torches of the coral-bean (*Erythrina*) arose frequently among the saw-palmetto (*Serenoa*) and the dried ponds supported a generous growth of the Peruvian evening-primrose (*Jussiaea peruviana*), this station being at its northern geographic limit or near it. In a few low areas where capillary water was particularly available, sneezeweed (*Helenium*), beggar's-ticks (*Coreopsis*), and ragwort (*Senecio*) were massed in seas of yellow. The only other color much in evidence was the violet-blue of the spiderwort (*Trad scantia*). This tongue of land supports many excellent orange-groves, and the fruits of the Valencias and Satsumas, when just dead ripe, surpassed the best we had previously eaten. Returning to the main highway we hastened on to Cocoa.

The following morning found us on Merritt's Island. There we found that the big evening-primrose (*Raimannia Drummondii*) which was naturalized several years ago, was not only holding its own, but spreading. In some areas in the pinewoods the scrub-oaks usurped the usual habitat of the saw-palmetto or outclassed it. The oaks in different groups were strongly contrasted; those that had flowered were in full green leafage, while those still in flower were a decided brown on account of the brown-pubescent undeveloped leaves and the numerous brown catkins. Among them showy white flowers abounded in the Mexican-poppy (*Argemone intermedia*) and an albino morning-glory (*Ipomoea cathartica*).

Old fields had been usurped mainly by two plants, a milk-pea (*Galactia Elliottii*), an herb with long tough roots, and the gopher-apple (*Geobalanus oblongifolius*), a shrub with underground stems, both of them well adapted not only to holding their own but to persisting indefinitely and crowding other plants out. The guava (*Psidium Guajava*) was widely naturalized in and about the hammocks. There on the dunes the spruce-pine (*Pinus clausa*), then rather fluffy in appearance on account of its new growth, replaced the red-cedar (*Sabina silicicola*) of the Mosquito Inlet region.

The greater part of the shore line of the eastern coast of Florida will soon be accessible. Then a study of the chromatic

scale, so to speak, of the dune and lagoon vegetation from the Saint Mary's River to Cape Sable will be possible. It constitutes one of the many interesting problems presented by the vegetation of Florida.

The next leg of our course extended from Cocoa to Stuart, which is situated at the southern end of the Indian River. Our proposed examination of the coastal dunes of the Melbourne and Malabar region was frustrated by the still incomplete state of the bridge spanning the lagoon. Only casual observations were made along the way. The most instructive phenomenon was the general condition of the vegetation, that is, the advanced and flourishing condition of the deep-rooted woody and herbaceous plants and backward and indifferent condition of the shallow-rooted plants.

We next left the mainland at Hobe Sound and landed on Jupiter Island. This is a long and narrow undulating or rolling sand-dune extending from Saint Lucie Inlet to Jupiter Inlet, or about fifteen miles in length. Our limited observations showed it to be a region well worthy of special study. The plant-covering is largely saw-palmetto (*Serenoa*), with low or even miniature hammocks. The growth is dense and the branches pressed down and spread out by the wind from the ocean, so that there is given little chance for herbaceous vegetation to exist or gain headway. Still, in the more open places the dune-sunflower (*Helianthus debilis*), the butterfly-pea (*Bradburya virginiana*), the spiderwort (*Tradescantia reflexa*), the red-sage (*Salvia coccinea*), the dune-verbena (*Verbena maritima*), and the prickly-pear (*Opuntia austrina*) were in evidence. All vegetation was inclined to be depressed. Even the tallest of our partridge-peas (*Chamaecrista brachiata*) was spread flat on the sand; and the starry-jacquemontia (*Jacquemontia reclinata*), which usually sprawls over shrubs, often actually formed green lawns with the pale-green leafage studded with the white star-like flowers. Near the southern end of the island the sand is raised high on a coquina foundation. From such an elevation a view over the lower parts of the dunes suggests a vast green crazy-quilt. The many shades of green are conspicuous; they are even more numerous on the dunes south of Jupiter, perhaps because they face a little towards the southeast instead of to the northeast, and they are more densely and numerously populated with tropical broad-

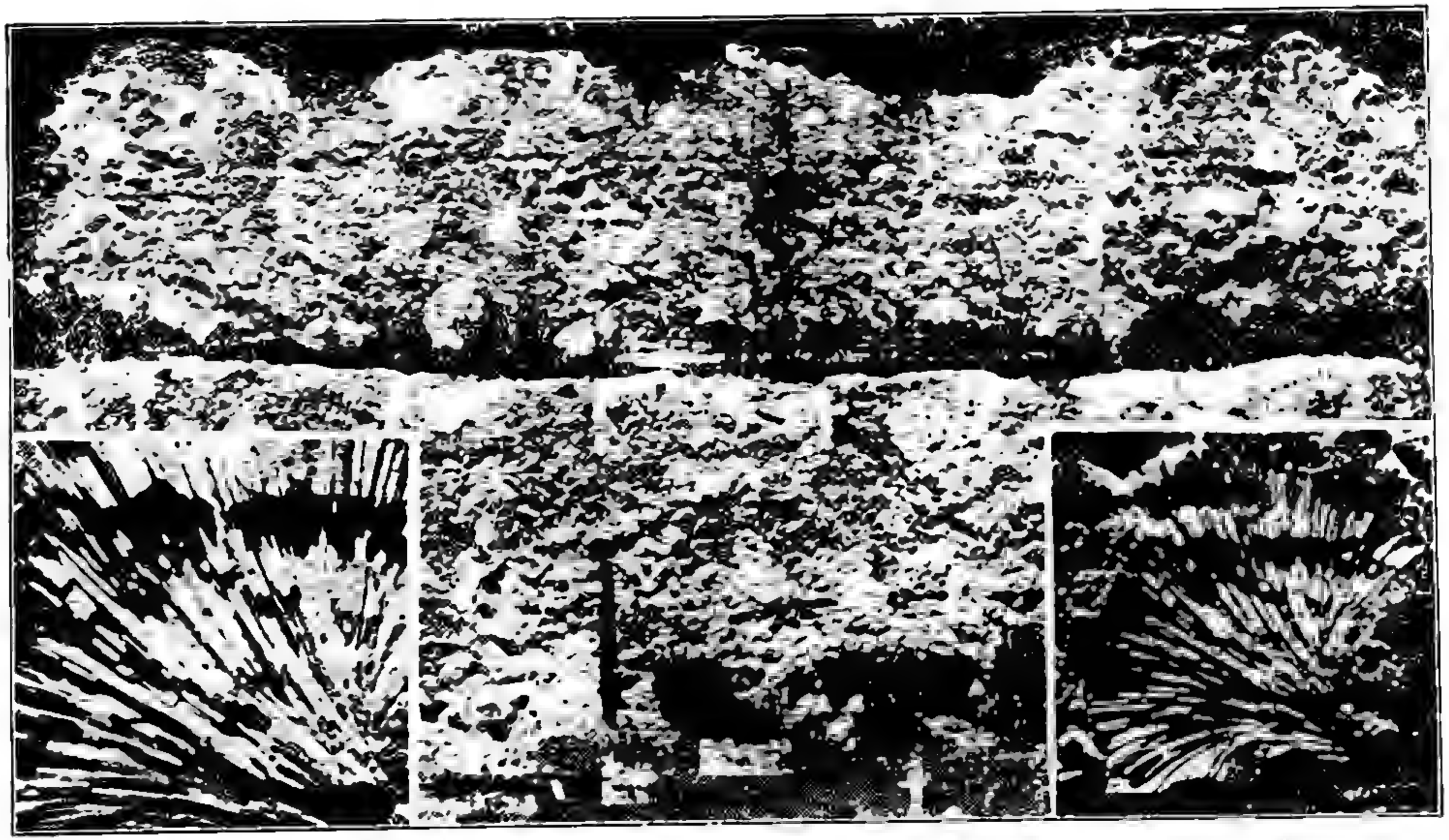
leaved shrubs and trees. This latter phenomenon may also be a result, at least in part, of the position of the coastline.

The great majority of the coast-wise tropical plants do not extend northward of the Palm Beach region, and Jupiter Island is, as far as we now know, the northern geographic limit of several tropical plants. For example, a sedge (*Remirea maritima*), whose slender stems run beneath the surface of the sand for a rod or more and give off at intervals erect densely leafy branches each of which terminates in a button-like spike; a narrow-leaved croton (*Croton Fergusonii*), whose leaves are sometimes used for making tea; the poison-wood (*Metopium toxiferum*), whose sap is very irritating to the skin; and the Bahamian nightshade (*Solanum bahamense*), which is an ornamental shrub on account of both its purple flowers and its bright berries which are often borne on the bushes at the same time.

Again returning to the mainland we continued our journey southward, but only as far as Palm Beach. *En route* we encountered more dead gardens. The beautiful cypress heads eight or nine miles north of Palm Beach had been swept by fire. These errestrial and aerial gardens, with their underbrush gone, were made very conspicuous by the black poles of the pond-cypresses. Trees bore myriads of black knots attached high and low—the charred remains of the dense clusters of air-plants, generations old, which only the season before were gay in their highly colored inflorescence. A sight to make one weep!

At West Palm Beach we headed westward on the trail that is planned to connect the eastern and western Florida coasts, via the southern shores of Lake Okeechobee. It then could be travelled twenty-odd miles—to a point beyond the only settlement on it, namely Loxohatchee—or more than half way to the lake. The country was a desert without an oasis.

The region was interesting, however, chiefly on account of its desolation. At eight to ten miles from the coast, willow-heads and cypress-heads and evening-primrose thickets denoted where water should be standing, but it was so far below the surface that herbaceous vegetation was unable to produce its flowers as it should have done at that season. A stray yellow heliotrope (*Heliotropium Leavenworthii*) attracted the eye occasionally. However, there was one plant present that defied the drought and flourished. The lavender-flowered morning-glory (*Ipomoea*



On Umbrella Key — A section of Key Largo Limestone — one of the very recent extensive natural geologic formations. It forms the upper Florida Keys. It is built up of the unchanged corals together with accumulated materials sand, shells, and broken corals. The merely weathered surface, with more or less humus, supports a tropical plant covering derived from the West Indies. The inserts show the structure of one of the fossil corals.

sagittata) has a root-system that enables it to grow equally well in moist mucky soil or in macadam. Here it grew in the macadam of the white oölitic limestone—covering parts of it with a lace-work of its narrow-lobed leaves—and bore numerous flowers with their large lavender corollas. We tarried but a short time in the Loxohatchee region and then set out for Miami, where we arrived in the evening.

A Cruise Among the Florida Keys

While we were on a three-day cruise to Lignum Vitae Key with Mrs. Arthur Curtis James and Mr. William John Matheson, where a large collection of bark-inhabiting lichens was made, the "Barbee" was put in commission at Buena Vista, and upon our return we boarded her and set out for Big Pine Key, about one hundred and thirty miles towards Key West. Calm weather favored us for two days. The floor of Steamboat Creek, which cuts off an arm of Key Largo, was quite visible and was carpeted with a succession of beautiful growths, more vigorous than we have seen elsewhere, of turtle-grass (*Thalassia*) and manatee-grass (*Cymodocea*). We lay in Jewfish Creek the first night out. The following day brought us to Big Pine Key. There was an almost dead calm throughout the course. As on a former occasion,[1] the horizon was indistinguishable even against a perfectly clear sky, and light clouds and their reflection made a more perfect camouflage. The distant keys all seemed to stand above the surface of the water—a kind of mirage effect.

The sounds and bays traversed were vast aquaria. The sandy or marly floors were either bare or populated, often densely so, with various plants and animals. Various flowerless plants, seaweeds, were in evidence on the bottom. Few specimens were floating, for those that had been broken loose before the calm had already been carried away by the action of the tides. Four kinds of flowering plants, all resembling seaweeds in habit more than the usual flowering plants, could be seen. They were turtle-grass (*Thalassia*), manatee-grass (*Cymodocea*), halodule (*Halodule*), and halophila (*Halophila*). Among the prominent anchored animals were sponges, ranging from the coarse, often gigantic "loggerhead" to the delicate "sheepswool," none, however, showing the delicate structure that is visible after they

[1] Journal of The New York Botanical Garden **22**: 54.

are cleaned. The corals varied from the ponderous "brains" to the delicate staghorn-like forms, among which the cuttle-fish like to hide and eject their black fluid when disturbed. The Gorgonians were plentiful, both as fans and as feathers which waved in the waters either as a result of the tide or passing of fish.

At dusk we cast anchor off the eastern side of Big Pine Key and at once went ashore to call on the residents of social and financial standing.[1] Early the following morning we went ashore again and examined the flora of the island as far north as the high land, or that above the influence of the tide, extended. Thus some six miles were traversed.

The high land of the key is now pine-clad, although it was, perhaps, at one time all hammock-clad, just as the upper Florida Keys are at present. Several censuses show that the herbaceous vegetation of the pinelands outnumbers the woody vegetation of the scrubby hammocks in a ratio of about four elements to one. This ratio has changed and will continue to change, for the hammock growth has been greatly reduced even within the last decade. The pinelands and hammocks resemble those of the Everglade Keys, and there are many plants in common in the two regions. However, there are some species, both of woody and herbaceous plants, that occur only on the Keys. For example, the savia (*Savia bahamensis*), white-ironwood (*Hypelate trifoliata*), caesalpinia (*Caesalpinia pauciflora*), tree-cacti (*Cephalocereus keyensis*, *C. Deeringii*), semaphore prickly-pear (*Opuntia*, new species), scraggly-milkwort (*Polygala praetervisa*), varnish-leaf (*Dodonaea Ehrenbergii*). Some of the lime-sinks filled with a growth of saw-palmetto (*Serenoa repens*) and saw-grass (*Mariscus jamaicensis*) abounded with the leopard-frog[2] (*Rana sphenocephala*). These habitats were formerly frequented by alligators and crocodiles, but these large animals have mostly disappeared. A white-heliotrope (*Heliotropium polyphyllum*) proved an addition to the flora of the Florida Keys.

The afternoon was spent in the hammock on the southern extension of Big Pine.[3] The combined effects of a long drought and the storm of the previous year did not render it as prolific

[1] Journal of The New York Botanical Garden **18:** 104.

[2] Coastwise dunes and lagoons. Reprinted from Journal of The New York Botanical Garden **20:** 191–207, frontispiece facing page 191.

[3] Journal of The New York Botanical Garden **22:** 50–53.

in results as one would normally expect. Except where the charcoal burners had made trails and clearings, the jungle was a riot of tropical shrubs and trees, and it was almost impenetrable, or quite impenetrable where the cacti grew abundantly. There, woody vegetation abounded almost to the exclusion of the herbaceous. The woody vegetation was made up mainly of about two dozen tropical shrubs and trees, the larger being buttonwood (*Conocarpus*), poison-wood (*Metopium*), and sea-grape (*Coccolobis*). The latter, contrary to its usual habit, grew with straight erect trunks. Thorny p'ants were particularly noticeable in traversing the jungle, among which may be ment'oned buckthorn (*Bumelia*), tallow-tree (*Ximenia*), blackbead and cat's-claw (*Pithecolobium*), century-plant (*Agave*), and indigo-berry (*Randia*). The last-mentioned plant occurred as a small tree, just as we found it in the hammocks along the Halpatioke River[1] about a year before. The conspicuous shrub was one of the dogbane family, the tear-shrub, *Valesia glabra* by botanical name. Its deep green, glossy foliage is contrasted strongly with the clusters of white, slender, trumpet-shaped flowers and the drooping, pearly, tear-like fruits.

Herbaceous plants aside from tropical weeds were very scarce. This group was most in evidence through air-plants which clung desperately, so to speak, to the trunk of the rough-barked trees; even the cacti were hosts for epiphytes. Several kinds of *Tillandsia*, both small and large, and a tree orchid (*Encyclia tampensis*) constituted the assortment. A number of shrubs bore fruits of different colors. These may have been the magnets that attracted the flocks of black-birds, the first we ever noticed on the Florida Reef.

In crossing the grassy plain between the hammock and the water in a course we had not before taken, we stumbled into very extensive beds of a prostrate prickly-pear. It was quite different from any we had previously found. The loosely articulated joints were very unequal and turgid, armed with relatively very long slender spines. No flowers were present, but the fruits —smaller than those of any of our known species —were red. From the condition of the fruits, the autumn would seem to be its flowering season.

[1] Journal of The New York Botanical Garden **23**: 154.

A noteworthy collection of lichens was secured from all parts of Big Pine Key. This will be referred to under another paragraph.

The afternoon was quite blustery, so we moved up into the harbor of No Name Key and anchored there for the night. The last hour of daylight was spent on No Name Key collecting lichens, and visiting some of the inhabitants. Our hosts related many of their experiences in that fascinating region which was so far "out of the world" before the railroad was built over the Keys.

The following morning we passed around the northern end of No Name Key and started up the Bay of Florida bound for Long Key. There we collected lichens. We were surprised to find the Australian pine (*Casuarina*) naturalized on the dunes back of the barrier beach, evidently having originated from fruits washed ashore during storms. Darkness found us in the lee of Lignum-Vitae Key, where we spent the night.

At dawn we moved on to Umbrella Key and Long Island. Collections of lichens were secured from both these islands. The barks of the slow-growing trees yielded much of interest, particularly different kinds of the genus *Graphis*. The trunks of the white ironwood (*Hypelate*), a tree known from only three keys, harbored several kinds of lichens we had not before collected. This tree also served as an arbor for the tropical passion-flower (*Passiflora multiflora*), whose stems were woody and several inches in diameter. There seems to be more original hammock on Umbrella Key than on Long Island. However, a large part of the original growth has disappeared as the result of the quarrying of rock for the road-bed of the railroad and for building purposes on the mainland. The key is said to be about eighteen feet high, the highest of the whole chain.

The perpendicular walls of the quarry, cut through the solid coral limestone, showed some beautiful sections of the ancient gigantic corals whose long-continued growth formed the reef. The remains of the backbone of this pristine key—later raised out of the sea—form the present chain of upper keys.

The bottom of the quarry, although composed of recently broken down and almost pure coral limestone, supported a growth of at least a dozen herbs and shrubs. These plants grew as luxuriantly as they usually do in good soil. They were:

Andropogon tenuispathis
Sporobolus domingensis
Chloris polydactyla
Cyperus brunneus
Iresine paniculata
Sesuvium maritimum
Poinsettia heterophylla
Ipomoea cathartica
Calonyction Tuba
Varronia globosa
Solanum verbascifolium
Morinda Roioc

The sea-purslane (*Sesuvium maritimum*) was new to the flora of the Upper Keys.

We were anchored near the mangroves. Their extensive root-systems were then the rendezvous for crayfish which were present in great numbers. This crustacean, sometimes known as southern lobster, is one of the many kinds of animals with decided coloring and fantastic shapes that abound in the waters of the Florida Reef.

We continued on our course through Blackwater Sound and night overtook us as we passed through Jewfish Creek. However, we continued and crossed Barnes Sound, heading for the approximate position of Steamboat Creek. After nosing about the mangroves in the dark for a while, we located its mouth and were soon in Card's Sound where we anchored for the night in the lee of Pumpkin Key.

The early morning found us in the original hammock of Key Largo and in another rich lichen field. The tree-trunks served a hosts for hepatics as well as for lichens. The hepatics, however, grew near the base of the trunks, while the lichens grew higher up.

Each day the animal kingdom forced its presence on us. There we walked into a rat-town. The large wood-rats of the island select a tree from beneath which they can excavate the humus. This feat is easily accomplished, for the tree usually is propped up from the rocky floor of the hammock and the humus is loose. As an addition, the rat usually builds a shack two to three feet wide and four to six feet long, composed of sticks one to three inches in diameter. These are piled up to a height of one to three feet in an irregular fashion. Beneath this structure they carry on their domestic operations.

Our field of activity was next transferred to Pumpkin Key, which is situated near the upper end of Key Largo. There we found another rich lichen field which we harvested. Several vegetable entanglements were encountered. They comprised the intertwined branches of the cat's-claw (*Pithecolobium*

Unguis-cati) and the devil's claws (*Pisonia aculeata*). Both these plants harbored many lichens on their bark.

The lignum-vitae (*Guiacum sanctum*) was in flower. The corollas have a shade of deep-blue seldom met with in our flora. However, the flowering plant that interested us most was a tropical vine related to our pokeweed (*Phytolacca*). This vine is a woody climber whose rope-like branches spread about the tops of trees and are connected with the ground by a stout cable-like stem. This vine was previously known in our flora only from the Ten Thousand Island region of Florida After Pumpkin Key, Miami and headquarters were our destination.

From Miami to Ten Thousand Islands

Our next excursion took us to the Ten Thousand Islands. The course was by land, and consequently twice or thrice as long as the water route. However, before a great while there will be three almost direct highways from the eastern coast across the Everglades to the western coast. At present a detour around the head of Lake Okeechobee is necessary

The drive to the head of Lake Okeechobee was about the most uninteresting one of the several times we have been over that route. The few kinds of plants that were in bloom were conspicuous mainly on account of the absence of others. However, one plant in particular stood out prominently—the railroad-vine (*Ipomoea Pes-capri*). Large patches were frequent with the showy lavender-purple flowers, in spite of the fact that it was growing in the pinewoods instead of on the coastal dunes. Otherwise the pinewoods were almost bare except for an occasional dash of bright yellow made by colonies of beggar's-ticks (*Coreopsis Leavenworthii* , yellow-heliotrope (*Heliotropium Leavenworthii*), or shore sunflower (*Helianthus debilis*). A recent shower had brought a little more green to the vegetation of the "scrub," but the annual flowering plants had not yet started to show themselves.

Many century-plants (*Agave*) were in flower The naturalized sisal (*Agave rigida*) is the most prolific bloomer, but its flowers are usually replaced by bulblets, instead of by fruits. The native shore-century-plant (*A. decipiens*) is the next in order as a bloomer.

After leaving the coast at Jupiter and heading westward, we noticed well-developed mangroves at the first creek-crossing and evidently beyond the influence of salt-water.[1]

Hungry Land was not the flower-garden it usually is. Although the water-table could not sink far beneath the level of the land, its lowered position at that time had a profound effect on the vegetation. Few kinds of plants were in bloom. Several showy-flowered plants, however, such as ironweed (*Vernonia Blodgettii*), marsh-pink (*Sabbatia grandiflora*), grass-pink (*Limodorum Simpsonii*), sometimes in the albino state, tall-milkwort (*Polygala cymosa*), and showy morning-glory (*Ipomoea sagittata*) stood out in strong contrast with such neutral-tinted inflorescences as those of dog-fennel (*Eupatorium capillifolium*), Indian-plantain (*Mesadenia lanceolata*), and black-root (*Pterocaulon undulatum*). Here, too, the fresh-water coco-plum (*Chrysobalanus pellocarpus*), which seems to reach its northern geographic limit there, was coming into flower.

Across the Hungry Land slough, on the Alapattah Flats, quite a different flora was sparingly represented by such plants. then in flower, as false-aster (*Sericocarpus reticulatus*), milk-pea (*Galactia Elliottii*), milkweed (*Podostigma pedicellata*), white-milkwort (*Polygala Baldwinii*), and sage-tea (*Pycnothymus rigidus*). The sun was setting in the lake as we reached Okeechobee. In the lake hammock the rich soil, where the fires had spared it, gave all the vegetation an exaggerated height and luxuriance, consequently the elder (*Sambucus intermedia*), the two wild-coffees (*Psychotria undata* and *P. Sulzneri*), the bracken (*Pteris caudata*), the poke (*Phytolacca rigida*), the false-nettle (*Boehmeria scabra*), and the thistle, apparently not botanically named, reached twice as high as one's head. The tropical hemp-vine (*Mikania cordifolia*) was rampant and filled the air with its violet-scented fragrance.

Our attempt to run up the lake shore from the settlement of Utopia to Okeechobee City was blocked by the condition of the sand and vegetation. So we drove back to the prairie and spent the evening picking our way through the heavy sand until we ran into the Fort Pierce-Okeechobee road. A curious difference in the natural packing of the sand in the higher and lower parts of the prairies surrounding Lake Okeechobee is evident. That

[1] Journal of The New York Botanical Garden 20: 194.

in the higher parts packs so that it supports the tires of a motor car, while that especially which is under water part of the year, acts as a quicksand whether wet or dry.

There we were in a vast dead and dying garden—the Lake Okeechobee basin in the immediate vicinity of the lake. The wreckage was overwhelmingly evident everywhere. The prairie was still a green desert truly, but the scrubby vegetation —shrinking in size and area year by year as a result of fire and drainage—was unrelieved by flowers of any kind, and the primeval lake hammock with its humus foundation still sent up clouds of smoke from the areas that had not been destroyed in preceding years.

After spending the night at Okeechobee City we set out for the upper waters of the Caloosahatchee and for Fort Myers at its mouth

The prairies east of the Kissimmee River were dry, even the peculiar pop-ash hammock described in a former paper[1] was perfectly drained, whereas the last time we crossed it there was over a foot of water standing there. The floor of the hammock was a botanic garden. Ground-covers were plentiful and extensive. For instance, a small arrow-head (*Sagittaria*) with white flowers, water-lettuce (*Pistia*) and water-hyacinth *Piaropus*), both depauperate on account of the drought, Saint John's-wort (*Hypericum*), with yellow flowers, water-purslane (*Isnardia*), with inconspicuous flowers but glossy green leaves, mud-carpet (*Hemianthus*), false-pimpernel (*Ilysanthes grandiflora*), with white and lavender flowers, and lobelia (*Lobelia Feayi*), with bright-blue flowers, hid the white sand from view. The most showy shrub was a mallow (*Hibiscus grandiflorus*) which bears great white or pink flowers six to eight inches wide. Large beds of ferns, mainly of three different kinds—royal-fern (*Osmunda regalis*), leather-fern (*Acrostichum excelsum*), wood-fern (*Dryopteris gongylodes*)—filled a large part of the hammock. In some of the open parts of the hammock the soil was suitable for an exceptionally luxuriant growth of the pickerel-weed (*Pontederia cordata*), lizard's-tail (*Saururus cernuus*), and the leather-fern, for the two former were as high as one's head, while the fern was thrice as tall. The epiphyte were flourishing

[1] Journal of The New York Botanical Garden **22**: 61, 62.

on the pop-ash trees and some were coming into flower. Five kinds of bromeliads and one orchid grew on nearly every tree.

Only three flowering herbs were evident in the grass of the prairies toward the Kissimmee River. Scattered through the grass were numerous flowers of the butterfly-pea (*Bradburya*); —an apt popular name, like so many others, for the flowers did resemble so many blue butterflies. Two tall slender plants, the pink-milkwort (*Polygala incarnata*) with rose-purple flowers and a flax (*Cathartolinum Curtissii*) with yellow flowers, were scattered nearly everywhere. The frequent prairie fires had spared some parts, and there elders (*Sambucus*) and tall sage-verbenas (*Lantana*) had sprung up in the saw-palmetto islands and decorated them with their white, yellow, and purple flower-clusters.

About Cabbage Bluff—this name was not derived from the Old World cabbage (*Brassica*) but from the palm, the cabbage-tree (*Sabal Palmetto*)—where we crossed the Kissimmee River, the shores, marshes, and blind channels of the stream were completely covered or choked with four large aquatic plants. These were water-lettuce (*Pistia*), water-hyacinth (*Piaropus*), spatterdock (*Nymphaea*), and water-lilies (*Castalia*). Of course, there were smaller aquatics, such as pondweeds (*Potamogeton*), arrowheads (*Sagittaria*), and floating-heart *Nymphoides*) whose flowers resemble miniature pond-lilies.

Some of the species of these genera are not to be caught napping when adverse—dry—conditions arise, for some have propagating buds in their leaf axils, others starchy tubers underground, and yet others clusters of tuberous roots in the inflorescences, all of which enable a parent plant, should adverse conditions conspire to destroy it, to perpetuate the species by vegetative reproduction.

The Indian Prairie was dry, even to the deepest sloughs. In the sloughs, nevertheless, the saw-grass (*Cladium*) and the usually accompanying Saint John's-wort (*Hypericum fasciculatum*) were in flower. The saw-palmetto islands had their accompanying Saint John's-wort (*H. opacum*). The prairie was not as floriferous as usual, but some flowers were in evidence. Small patches of purple thistle stood out in the brown-green carpet; larger areas, conspicuous and even brilliant, of the rose-purple foxglove (*Agalinis fasciculatus*) made a wonderful show. There was one ubiquitous plant, a pipewort (*Syngonanthus*),

which showed itself by millions of little erect heads of flowers, resembling so many white shoe-buttons.

Here again we passed hundreds of dead garden spots, for fires sweeping across the prairie had frequently devoured the cabbage-tree hammocks where the dried leaves of years' accumulations had furnished fuel of the most dangerous kind. These numerous palm-clumps, varying from a square rod to acres in extent, stood out as black spots in the landscape—and as blemishes on the record of man's "progress."

The undamaged cabbage-tree hammocks yielded some interesting lichens and a very peculiar slime-mould which resembled piles of finely divided iron-rust.

Having crossed the Indian Prairie and come into the valley of the Caloosahatchee, we headed up the northern side of the river to hunt for an Indian mound or tumulus. This we soon located lying about two hundred yards north of the road. The body of this mound covers the larger part of an acre. From the body a tail-like ridge runs off towards the southeast, while two slightly divergent ridges extend towards the northwest from the opposite side. At the time of our visit there were about thirty different kinds of plants in evidence on the body of the mound, which is built up of sand. These plants were about equally divided between herbaceous and woody kinds. Among the woody plants were one pine (*Pinus palustris*), two palms (*Sabal Palmetto*, *Serenoa repens*), one woody vine (*Smilax Beyrichii*), and five oaks (*Quercus pumila*, *Q. minima*, *Q. myrtifolia*, *Q. Chapmanii*, *Q. geminata*). The herbaceous plants represented famiiles ranging all the way from the grasses to the thistles.

We drove eastward to within three or four miles of Lake Hicpochee, thence back to La Belle. Along the way were several kinds of hammocks. In the pop-ash hammocks the ash trees were in fruit and the clusters of winged fruits often seemed to rival the leaves in numbers. The more common mixed hammocks were made up mainly of oaks (*Quercus virginiana*, *Q. nigra*), sour-gum (*Nyssa biflora*), red-maple (*Acer rubrum*), cypress (*Taxodium distichum*), and cabbage-tree (*Sabal Palmetto*). The large limbs of the live-oaks were often completely covered with a growth of the air-plant (*Tillandsia tenuifolia*), which was particularly noticeable on account of its dark-red foliage. The only conspicuous flowering herb on the way to La Belle was

the southern beard-tongue (*Penstemon multiflorus*), a beautiful plant, as are most of the beard-tongues, particularly many of those west of the Mississippi River, where the genus is legion.

From La Belle we drove direct to Fort Myers, and the next morning we set out for the Ten Thousand Islands. South of Fort Myers the land is rather low and consequently the water-table never sinks very far beneath the surface. More herbaceous plants were in bloom there than north of the Caloosahatchee.

In the higher pinelands pink often predominated among the flowers on account of an abundance of marsh-pink (*Sabbatia campanulata*), while in other places yellow was the dominant color, as a result of quantities of coreopsis (*Coreopsis Leavenworthii*). In the low parts and in ditches close ground-covers predominated as large patches of green water-hyssop (*Bramia*) with numerous pinkish flowers, and the individually minute mud-carpet (*Hemianthus*) with very numerous pinkish flowers which, however, are so small that a lens is necessary for seeing them. Besides being so small the corolla is very irregular, for the upper part is almost wanting. Scattered among the ground-covers were a red-topped rush (*Juncus*), a purple-foxglove (*Agalinis*), a purple thistle (*Cirsium*), and a purple-blue obedient-flower (*Dracocephalum*).

From Fort Myers to Naples pinelands predominate, but they are interrupted by areas of "scrub" or "barren." Some of these are characterized by the presence of the upland willow-oak (*Quercus cinerea*), others by scrub-oaks (*Quercus Chapmanii, Q. myrtifolia*), still others by the dwarf-oak (*Quercus pumila*). The characteristic "scrub" with the rosemary (*Ceratiola ericoides*), spruce-pine (*Pinus clausa*), and the scrub-oaks is met with north of Naples. At Naples various plant associations meet, the pinelands, the "scrub," the salt marshes, and the mangroves, comprising all four of the mangroves—the red (*Rhizophora*), the white (*Laguncularia*), the black (*Avicennia*), and the button (*Conocarpus*). These associations are dove-tailed together, as it were.

A third attempt to get into the Royal Palm Hammocks back of Marco was frustrated by the depth of the dry sand, but we managed to advance to within a mile of them.[1] The marshes

[1] Journal of The New York Botanical Garden **22**: 59; **23**: 144.

along Tamiami Trail were quite dry. There were great clumps of buckthorn (*Bumelia angustifolia*), the fragrance of whose flowers somewhat resembles that of the saw-palmetto and likewise fills the air in the vicinity of the plants. With it was associated such lowland plants as groundsel-bush (*Baccharis angustifolia*) and marsh-elder (*Iva frutescens*), and such highland shrubs as myrsine (*Rapanea guianensis*) and indigo-berry (*Randia aculeata*).

We doubled five miles on our trail to the Marco road. Once on it we were soon in sight of Marco. As soon as we got on the island we continued southward to Caxambas among the great sand-hills facing Caxambas Pass, just at sundown. Caxambas, however, was not our destination, but it was the end of motor-car possibilities. We at once secured the services of a small motor-boat to carry us to the settlement of Everglade, which is twenty-odd miles further down the coast. We decided to wait until morning for the trip, as a few hours' rest was welcome as a change from the undue exercise of the day in getting our motor-car through miles of deep sand. The course, too, lay partly in the open Gulf of Mexico and partly through a labyrinth of mangrove-clad islands. We spent the night on the top of a sand-hill eighty-odd feet above tide, from which there was an enchanting view over the settlement of Caxambas, the Gulf, the islands, and the mainland. In the settlement between the sand-hills and the water stands a beautiful grove of coconut palms. The trees were planted there in 1886 and form the most northern hardy coconut palm grove on the western Florida coast.

Noon found us at Everglade; the settlement consists of a general store and a few houses strung out along the banks of the Hayatipotato, now called Allen River. There is high ground near the mouth of the river, but it rapidly slopes off into marshes a short distance upstream. The settlement dates from 1866 and it is said the early settlers were fugitives from justice. The first Indians, since the Seminole war times, appeared there in 1882. Since that time there have been permanent and temporary Indian settlements throughout the surrounding country.

We ascended the river to its source. The banks are mostly mangrove-lined. As the stream becomes narrower the mangroves meet overhead and form a tunnel. For some unexplained reason, along the upper reaches of the river, the red-mangroves get smaller

while the black-mangroves grow larger. That we were getting into the Indian country was evidenced by the presence of dugout canoes in the river. These are made of trunks of the cypress (*Taxodium*).[1] There were two sizes of canoes, large ones for the wet season and plenty of water and small ones for the dry season and scant water. From the source of the river we continued northward, on foot, over the prairie for a mile or two, and then headed westward toward a point of cypress about three miles distant. This point was one of our local destinations and a locality we had wished to visit for many years. Out there as far as the outlook indicated, we might have been a thousand miles from anywhere, but we met an ox-team carrying a surveyor's outfit, and we were on the very line of that part of the proposed Tamiami Trail, which highway is planned to connect Miami with Tampa, *when it is finished.*

However, all the outlook was not pleasing, for in all directions, near and far, clouds of smoke were ascending into the almost motionless atmosphere. The long drought had turned a large part of the vegetation into tinder, and prairies, pinelands, hammocks, and cypress strands were food for terrific conflagrations. Some of the plant-associations were permanently destroyed, for these areas would never be replaced by the same vegetation.

Various kinds of woody vegetation were visible in the distant landscape. The composition of each "head" or "strand" of trees could be recognized at the distance of several miles. Thus, a very light-green indicated *cypress*, an intermediate green indicated *hammock*, while dark-green betokened *pines*.

We hastened over the prairie to the point of cypress, which was a short strand of pond-cypress extending out from a hammock composed of a mixture of shrubs and trees, some characteristic of northern climes, others of southern.

This point of cypress was the type locality for *Serenoa arborescens*.[2] It was discovered there in the spring of 1888 by the late Pliny W. Reasoner.[3] We were not long in finding the very trees

[1] Natural History **20**: 488–500. 1920.

[2] Journal of The New York Botanical Garden **23**: 61–70.

[3] Pliny Ward Reasoner was born May 6, 1863, at Princeton, Illinois, where he received his education and at an early age became interested in botany and horticulture. About 1883 he went to Florida, establishing the Royal Palm Nurseries at Oneco, and in 1885 formed a partnership with his brother,

from which the type specimens were taken. The palms were not in flower, but otherwise they are identical with *Paurotis Wrightii*. Of course, the palm is not a *Serenoa* and the plants there differ in no respect from those further south in the peninsula. The type locality for *Serenoa arborescens* is given as Royal Palm Hammock east of Cape Romano.[1] This is not the case. Neither of those geographical designations for the original locality of this palm are correct. In other words, "*Serenoa arborescens*" was not discovered near the Chokoloskee River or in the Royal Palm Hammock; but was first collected in a point of cypress mentioned above, a locality midway between the two stations cited above which are twenty-odd miles distant from each other. It is true, however, that there were three specimens of royal palms growing with the saw-cabbage palm (*Paurotis*) when the latter was discovered there. We found the remains of the trunks of these royal palms. The trees had been killed during the "freezes" of 1894 and 1895, which came only six weeks apart. It is not known how many royal palms were killed in that region during those years as a result of the cold weather, for the palms occupy considerable territory; besides the Royal Palm Hammock there is the Fahkahnatchee Cypress through which they grow for a distance of about fifteen miles. That the royal palm was formerly more abundantly widespread in Florida is evident, for William Bartram[2] found trees growing

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E. N. Reasoner, under the name of Reasoner Bros. He was horticultural superintendent in charge of the subtropical exposition at Jacksonville, 1887–88, and one of the three Florida commissioners to the Atlanta exposition of 1888; and he was becoming widely known as a cultivator of tropical and subtropical plants and a contributor to horticultural literature when an attack of yellow fever suddenly terminated his career, at the early age of twenty-five. He died at Manatee, Florida, September 17, 1888. –John Hendley Barnhart.

[1] " . . . The existence of an undescribed palm on the Chockoloskee river was known to me as long ago as 1887, when it was discovered without flowers and fruit in the Royal Palm Hummock, not far from the town of Everglade, by the late P. W. Reasoner, of Oneco. Florida; . . . " C. S. Sargent in Botanical Gazette **27**: 92.

[2] William Bartram (1739–1823) was associated from childhood with the scientific work of his fatner, John Bartram (1699–1777), the first native American botanist. He accompanied his father to Florida in 1765, insisted upon remaining there, and settled as a planter on the St. John's River, where he stayed about two years. In 1772 he began the extensive journey in the Carolinas, Georgia and Florida, reported in his published "Travels." He was a botanical artist of much enthusiasm and considerable ability.—J. H. B.

in northern peninsular Florida in the latter half of the eighteenth century, as the following quotation will show:

"The Indian not returning this morning, I set sail alone. The coasts on each side of the Saint John's River between Lake George and Dexter Lake had much the same appearance as already described. The palm-trees here seem to be of a different species from the cabbage-tree; their straight trunks are sixty, eighty, or ninety feet high, with a beautiful taper, of a bright ash colour, until within six or seven feet of the top, where it is a fine green colour, crowned with an orb of rich green plumed leaves: I have measured the stem of these plumes fifteen feet in length,[1] besides the plume, which is nearly of the same length."

It is suspected that these trees were killed during the severe cold weather of the thirties of the last century, or earlier. The object of our errand being accomplished, we returned to Everglade for the night.

Our next objective was Deep Lake, which lies in the wilderness about twelve miles north of Everglade. A worn-out tramway connected the two places and a brokendown gasoline "hand-car" constituted the rolling-stock. After some one broke the lock of the car we commandeered it and finally, after the application of considerable foot-power, as well as of motor-power, we achieved Deep Lake. This is one of those "bottomless" lakes of southern Florida.

Various explanations have been advanced to account for the existence of these lakes. Those of the Big Cypress and vicinity seem to be of the sink-hole variety. They appear to be formed by the falling in of the roofs of deep caverns that were formed when the land was much more elevated than it is at present. Such a cavern as exists under the everglade in Dade County, described in a former article,[2] would make a deep lake if the roof were to fall in. The rock rim of these lakes is very suggestive of what happened there ages ago.

These lakes are surrounded by more or less hammock growth. The size of the hammock or the length of its radius depends largely upon the width of the sloping periphery of the lake shore or the area which is kept moist enough to repel the fires of the

[1] Travels through North and South Carolina, Georgia and East and West Florida. 113, 114. 1792.

[2] Journal of The New York Botanical Garden **22**: 203–205.

In the Big Cypress Swamp.—A cypress strand near Deep Lake. Personae: Doctor Howard A. Kelly and "Doctor" Josie Billie and family of Seminoles, or in Indian parlance, of the Ikaniuksalgi. Josie Billie's materia-medica contains thirty-odd native plants. The flora of the Big Cypress comprises some rare orchids and other plants not found on the eastern coast. The plant associations of the two coasts are quite different.

surrounding prairies or pinelands. The Deep Lake hammock is extensive, covering many acres. It must have been the rendezvous of wild life, especially birds and mammals, while the aborigines held the country. Today the lake is a vast aquarium abounding in fish and in alligators, which may be seen floating at the surface of the water.

The few miles from the coast-region makes quite a difference in the vegetation. For several miles up the Allen River, the tropical mangroves flourish, as already stated; with them is the snowberry (*Chiococca*), the gray-nicker (*Guilandina*), and the cat's-claw (*Pithecolobium*). The arboreous constituents of the Deep Lake hammock are the swamp-bay (*Tamala*), pop-ash (*Fraxinus*), cornel (*Svida*), mulberry (*Morus*), and maple (*Acer*).

The flora of the prairie and pinelands intervening between the coast-region and Deep Lake naturally is quite distinct. At the time of our visit purple thistles (*Cirsium*) and grass-pinks (*Limodorum*) were very plentiful. The greenish-milkwort (*Polygala Carteri*), first discovered on the opposite side of the peninsula, filled the low places. The eryngo (*Eryngium synchaetum*), from which the Seminole Indians make their black drink, was in flower and fruit. Our best discovery there, however, was a new kind of yellow-flax (*Cathartolinum*). This is a robust leafy plant, one to three feet tall, with yellow flowers about three-quarters of an inch in diameter—the largest of our eastern yellow-flaxes.

Midway between Everglade and Deep Lake we encountered a large Indian camp. Here we met Josie Billie, the locally celebrated Medicine-man of the Seminoles, so Doctor Howard Kelly of the white men and "Doctor" Josie Billie of the red men met for the first time on the wild frontier between the white and the red civilizations.

When we returned to Everglade we found the mail boat waiting to carry us back to Caxambas, which was reached in due time. There we cared for our collections and in the morning set out for Fort Myers.

The great dunes of Caxambas are worthy of especial study. We could give some of them only a passing survey. The soil is very poor—almost pure sand—but vegetation is abundant, even rank; it is frequently almost impenetrable. On the lower slopes the trees are taller, but formed into a perfect entanglement

by the viciously armed cacti,—dildo (*Acanthocereus*) and prickly-pears (*Opuntia*)—as well as numerous rigid shrubs and century plants (*Agave decipiens*), which frequently grew densely leafy stems (caudices) five feet tall. On the higher slopes the trees and shrubs are more stunted, often intricately mixed, and often bound together by a rampant growth of vines, such as the bullace-grape (*Muscadenia Munsoniana*) and the cat-brier (*Smilax Beyrichii*). An annual herb, *Palafoxia Feayi*, thrived luxuriantly in the barren sand, the plants being frequently twelve to fifteen feet tall and partly woody as well.

The woody covering of the dunes is a mixture of maritime and inland tropical and temperate elements, as the following short list will show:

Tropical elements –

Strangling-fig (*Ficus aurea*)
Coral-bean (*Erythrina arborea*)
Soap-berry (*Sapindus Saponaria*)
Spanish-stopper (*Eugenia buxifolia*)
White-stopper (*Eugenia axillaris*)
Snowberry (*Chiococca alba*)

Maritime elements—

Century-plant (*Agave decipiens*)
Bay-leaved caper-tree (*Capparis cynophallophora*)
Jamaica caper-tree (*Capparis jamaicensis*)
Necklace-pod (*Sophora tomentosa*)
Dildo (*Acanthocereus pentagonus*)
Saffron-plum (*Bumelia angustifolia*)

Temperate elements—

Chapman's-oak (*Quercus Chapmanii*)
Twin-oak (*Quercus geminata*)
Hackberry (*Celtis mississippiensis*)
Gopher-apple (*Geobalanus oblongifolius*)
Sumac (*Rhus obtusifolius*)
Swamp-bay (*Tamala pubescens*)

The natural structure of the area comprising Marco Island and Caxambas Island is composed of three steps, as it were—the northern end a mangrove swamp before it was filled in to make it habitable; the middle part pineland and "scrub;" the southern end almost mountainous sand-dunes, as already noted above, and elsewhere.[1] The dune portion, really Caxambas

[1] Journal of The New York Botanical Garden **23**: 142–144.

Island, is nearly or quite separated from the rest by a mangrove swamp. Just why those great dunes should have been piled up with all the land about them only a few feet above tide-level is a mystery.

Curiously enough, we found the prickly-pear (*Opuntia*), which is so common on the higher parts of the Caxambas dunes, to be so much like that on the nearly flat dunes south of the mouth of the Saint John's River that with the habit, the shape of the joints, and the fruits, we could not consider them different species.

As soon as we were off Marco Island we made all possible haste towards Fort Myers, stopping only for casual observations and collecting, and to replenish our stock of citrus fruits upon which we largely subsisted. We reached Fort Myers about noon and almost immediately set out for La Belle, for the following day had been set aside for a raid on the Devil's Garden. This region, so named by the Indians who used to live there, lies far beyond civilization south of Lake Hicpochee and about thirty miles southeast of La Belle.

In the morning we were joined by our friend Dick Currey, who was raised with the Indians in the Devil's Garden, and who, consequently, knew the lay of the land thoroughly. After leaving La Belle we passed over prairie, through mixed hammocks, pop-ash hammocks, palmetto thickets, and pinelands, and more pinelands, until we thought they would never end, especially as we met with almost endless loose sand, and had a weak motor and a radiator that reminded one more of a street sprinkler than the thing for which it was supposed to function. However, after several hours of perseverance, tempered with patience, the panoramas of the Devil's Garden came into view.

The Garden is really a vast amphitheatre—five miles wide and nine miles long—surrounded by pinewoods. In it ever-changing pictures of combinations of hammocks, cypress-heads, cypress-strands, and prairies present themselves to the visitor. It is no wonder that the red man selected it as an ideal home, and it is strange that he left it, unless it be that the white man slaughtered the game upon which the Indian was dependent for food.

The wide prairies were bedecked with white and various-colored flowers—pink to dark rose-purple. The white-heliotrope

(*Heliotropium polyphyllum*), the pale milkwort (*Polygala Carteri*), the pale lobelia (*Lobelia paludosa*), the yellow-eyed grass (*Xyris ambigua*), the rose-purple foxglove (*Agalinis fasciculata*), the obedient-plant (*Dracocephalum denticulatum*), all occurred in large colonies. The largest flowered herb was the alligator-lily (*Hymenocallis Palmeri*). The flower is a double-starred structure, the perianth forming one star, with the staminal crown and filaments forming the other. The plants do not grow in colonies, but are scattered singly broadcast over the prairie. The hammocks near the outskirts of the Garden were simple in constituents, live-oaks (*Quercus virginiana*), pop-ash (*Fraxinus caroliniana*), willow (*Salix amphibia*), cabbage-tree (*Sabal Palmetto*), and much to our surprise, trema (*Trema floridana*).

Associated with these scattered hammocks were islands of saw-palmetto (*Serenoa repens*), sometimes with erect trunks, and the cabbage-tree. The abundant fruits of these two palms and the acorns of the live-oak often furnish the main food supply of the wild hogs of the region.

In the heart of the Garden the hammocks were quite different and more complex. The make-up of the large hammocks was particularly noteworthy. About twenty shrubs and trees were prominently represented. Two trees, guava (*Psidium Guajava*) and lemon (*Citrus limonum*), were naturalized exotics, perhaps introduced generations ago by the aborigines. There were two kinds of oaks (*Quercus virginiana*, *Q. nigra*). Four trees (*Celtis*, *Tamala*, *Morus*, *Sageretia*) represented genera characteristic of temperate latitudes. Contrary to all expectations, more than a dozen kinds of tropical shrubs and trees formed the bulk of the hammock growth: for example, satin-leaf (*Chrysophyllum*), gumbo-limbo (*Elaphrium*), tallow-wood (*Ximenia*), wild-lime (*Zanthoxylum*), cordia (*Varronia*), marlberry (*Icacorea*), naked-stopper (*Anamomis*), lancewood (*Ocotea*), myrsine (*Rapanea*), wild-coffee (*Psychotria*), and strangling-fig (*Ficus*). Among many interesting features suggested by the above list, two stand out prominently. The cordia had not previously been found on the Florida mainland. It is noteworthy that not only all the plants of the tropical list, but every shrub and tree noted, bear fleshy fruits. The fruits of all are eaten by birds. Perhaps this rather highly specialized minor phytogeographic area was in former times a natural bird sanctu-

ary, and the present berry-bearing shrubs are the descendants of seeds brought from tropical parts by migratory birds.

Fires were raging in various parts of the garden, consuming the vegetation of the various plant associations. More than once we were compelled to make detours around the burning areas. It was a discouraging sight, but yet quite in keeping with the ecclesiastical pictures of the habitat of the sponsor for the name of the region.

We made a rapid survey of the Devil's Garden by a circuitous route and reached La Belle just after sundown. Then we rearranged our cargo of snakes, plants, and miscellaneous baggage and called it a day.

Early the next morning we started on a bee-line for Arcadia. Thus our proposed course lay across the watershed separating the Caloosahatchee from the Pease River. The region proved to be an unsettled wilderness, fascinating by its impressive expanse and solitude as well as by its plant content. On these prairies and semiprairies evident animal life is often nil. The stillness and the solitude are actually exhilarating.

On the prairies north of the Caloosahatchee even the saw-palmetto (*Serenoa*) showed the effects of the drought by a different shade of green in its leaves, which is not often met with in that vigorous plant. Many miles across the prairie distant hammocks or cypress strands appeared to resemble long mountain-chains. The great length of some of these was due not to actual length, but to the overlapping of the ends of short hammocks, all of which fused in the distance.

High hammocks are not the characteristic kind of woody growth in that region; when they do occur they comprise for the most part the live-oak (*Quercus virginiana*). Low hammocks are the rule. Unlike those south of the Caloosahatchee, characteristically northern kinds of trees and shrubs are not only in the majority, but usually are exclusively represented. Thus we found sour-gum (*Nyssa biflora*), red-maple (*Acer carolinianum*), small black-haw (*Viburnum odoratum*), Virginia-willow (*Itea virginiana*), pop-ash (*Fraxinus caroliniana*), and button-bush (*Cephalanthus occidentalis*) the main constituents of the hammocks, usually with an admixture of pond-cypress (*Taxodium ascendens*). Mosses, hepatics, and lichens abounded on the buttressed trunks of these various trees and shrubs.

Nowhere was the sandy soil of these hammocks exposed. Ground-covers carpeted everywhere. In some places, in the higher parts, a fine-stemmed spike-rush (*Eleocharis*) made a vivid green carpet, in other places a deep green carpet was formed by a dense growth of marsh-purslane (*Isnardia*), while here and there the more delicate and brighter green mud-carpet (*Hemianthus*) grew exclusively.

In the lower parts of the hammocks, where water stands during the wet season, a brown carpet covered everything. In some places it was formed by a semiaquatic moss—species of *Amblystegium*, in other places by a fernwort—*Azolla caroliniana*.

Both these plants lay matted on the sand ready to float as soon as the water would fill the depressions. Anchored in the then dry sand among these plant carpets was the spatterdock (*Nymphaea*) with not only its delicate submerged leaves developed, but with the buds of the large floating or erect leaves partly developed and ready to grow with the advent of the water. Epiphytic plants were not wanting in these hammocks. We noticed the gray-polypody (*Polypodium*), the Florida-moss (*Dendropogon*), four kinds of wild-pines (*Tillandsia*), and many rather diminutive colonies of the tree-orchid (*Encyclia tampensis*).

In some regions the higher areas of the prairies were islands of pineland instead of hammock. Still farther north the small hammocks were carpeted with a livid-green cover made up almost exclusively of a diminutive primrose-relative—false-pimpernel (*Centunculus pentandrus*). After we crossed the crest of the water-shed, if such apparently flat country can be referred to as a crest, more prairie flowers appeared. An alligator-lily (*Hymenocallis*), perhaps the same as the one we found in the Devil's Garden, was widespread. The higher lands supported colonies of pine-hyacinth (*Viorna Baldwinii*), blue-hearts (*Buchnera elongata*), and black-eyed Susan (*Rudbeckia floridana*); the lower levels supported large colonies of blue-flag, apparently an undescribed species of *Iris*, meadow-beauty (*Rhexia Mariana*), and black-weed (*Mecardonia acuminata*). Large areas, too, were showy in a way, even where individual flowers were absent, by the myriads of inflorescences of a red-topped nut-rush (*Rynchospora*), a red-topped rush (*Juncus*), and the black-topped broom-rush (*Schoenus*). In addition, a

peculiar green effect was produced by the odd one-sided spikes of toothache-grass (*Campulosus*).

During the afternoon thunder storms appeared in different directions and the cloud-effects gave many shades of green to the hammocks of the Pease River valley as we approached it. There, too, the small-leaved haw (*Viburnum obovatum*) was replaced along the stream by another species of the same genus —the more showy arrow-wood (*V. nudum*).

As soon as Arcadia was achieved we headed northward, with Zolfo Springs and Avon Park as our objectives. In the Arcadia region and northward, naturalized herbs appeared—red-peppers (*Capsicum*), and sneeze-weed (*Helenium tenuifolium*). The observations on these low plants brought to mind the fact that south of the Caloosahatchee trees were the naturalized elements—the lemon, the orange, the guava! All the way to Avon Park, where we arrived just after sundown, a native composite, the southern flat-top aster (*Doellengeria reticulata*), was ubiquitous and commonly showed itself in large white patches in the pinewoods.

Between Zolfo Springs and Avon Park we crossed another water-shed, and passed from the southern Florida flatwoods, which comprise a lar e part of the drainage region of the Pease River, to the southern end of the lake-region, which is in the drainage system of the Kissimmee River. The floristics of these two regions are sharply defined: one, the flat-woods, is the least specialized and least interesting of all the floral regions; the other, the southern end of the lake-region, is the most specialized and the most interesting.

Before setting out for the eastern coast, we devoted some time to exploring the ancient sand-dunes north, east, and south of Lake Jackson. It is, botanically, a fascinating region. It is distinctive, rather different from any other area in the State. It has the aspect of a semi-desert. The white sand is deep, loose, and apparently devoid of nourishment. Vegetation is stunted, but in spite of the apparent thinness of it and the large areas of barren sand, it is composed of numerous genera and species, many of them endemic.

Near the top of one of the dunes we found a sphagnum bog. It supported a diminutive forest of stagger-bush (*Desmothamnus*), wax-myrtle (*Cerothamnus*), swamp-bay (*Tamala*), and dahoon

(*Ilex*), all often bound into an almost impassible entanglement by the horse-brier (*Smilax laurifolia*). The chain fern (*Anchistea*) and yellow-eyed grass (*Xyris*) grew in the sphagnum with leaves taller than one's head. Scrub-oaks and a scrub-hickory usually comprised the most abundant arboreous vegetation, although stunted. The titi (*Cyrilla*, new species), discovered in that region several years ago, was found growing in two forms, the one with stout, rigid branches, the other with slender almost vine-like branches.

We were surprised to find the railroad-vine (*Ipomoea Pes-Capri*) in the heart of the peninsula. We have already mentioned its occurrence away from its typical saline habitat on a preceding page, and some years ago we found it on the shores of the fresh-water Lake Okeechobee.[1] Its existence on the desert-like dunes is still more noteworthy, for it is not only away from the saline influence, but also away from the water. The spruce-pine (*Pinus clausa*) was, apparently, wholly wanting; its place in the plant covering seemed to be taken by the turkey-oak or black-jack (*Quercus Catesbaei*). Many of the rare and endemic plants growing in this general region have been discussed in former papers.[2] The vegetable covering, however, shows differently each year, even at about the same season. This time was the first we had the good fortune to find one of our more beautiful morning-glories (*Bonamia grandiflora*) in flower. The funnelform corolla is large and of a decided blue color, thus forming a striking contrast with the white sand. Associated with it was one of our very small morning-glories (*Evolvulus sericeus*), with white flowers only about a quarter of an inch wide.

Two plants were present that made one think of the arid parts of Texas; the one, a tall-stemmed bear-grass (*Nolina*), whose very numerous long and narrow leaves formed a circular mat four to six feet in diameter on the sand; the other, a prostrate-stemmed angle-pod (*Vincetoxicum*), with star-shaped chocolate-colored flowers.

Although the general drought already referred to was by no means broken, the freshened leaves of the resurrection-fern (*Polypodium polypodioides*), which leads an uncertain existence

[1] American Museum Journal **18:** 698.

[2] Journal of The New York Botanical Garden **22: 37–39; 23: 146–148.**

on some of the scrubby trees, indicated a very recent rain-shower, although one would not have suspected it from the sand, which rather resembled granulated sugar in aspect and in consistency. Several succulents, in spite of the drought, were blooming profusely. Three kinds belonging to one plant family, a dew-flower (*Commelina*) with very irregular blue flowers, and two with regular flowers, those of one blue with entire petals (*Tradescantia*), those of the other pink with toothed petals (*Cuthbertia*), the latter perhaps new to science. Associated with these and one of the showy plants was a rose-purple acanthus-relative (*Ruellia*), whose large funnelform corollas remain on the plant about half a day and then fall and lie on the white sand for the rest of the day.

Instead of crossing the dunes lying between Lake Jackson and the Istokpoga Prairie in a half an hour, as we had anticipated, we spent a half a day in advancing the motor-car, inch by inch, almost literally, through the deep dry sand, in which the wheels usually sank up to the hubs. This delay greatly reduced our opportunity for collecting in the adjacent pinewoods and on the Istokpoga and Okeechobee Prairies. The afternoon was nearly gone before we got out of the sand.

On the way to Okeechobee City, the first settlement to the eastward, we noticed but few flowers in the pinewoods. Most of them were shades of yellow, St. John's-wort (*Hypericum*), yellow-buttons (*Acanthospermum*), bladder-wort (*Stomoisia*), all arising from a vast sea of saw-palmetto, of a vivid shade of green. The Istokpoga Prairie was still more barren of flowers. A low St. John's-wort (*Hypericum aspathaloides*) grew on the higher land, a tall one (*H. fasciculatum*) in the low places; a marsh-pink (*Sabbatia grandiflora*) struggled for existence here and there in the dry sand. There was, however, one plant present in countless myriads, perfectly normal in spite of the drought, just as it had been nearly everywhere we had been, regardless of geology, geography, altitude, and latitude—that vegetable hat-pin, each of which is stuck in a cushion of densely placed narrow leaves, a pipewort (*Syngonanthus flaviculus*).

We passed through a strip of hitherto unrecorded "scrub" west of the Kissimmee River and then came to the hammocks bordering the western shore of the river. The button-bush (*Cephalanthus*) was there in flower and the bushes were mostly

hidden by a copious growth of the tropical wild-hempvine (*Mikania cordifolia*), which was profusely decorated with clusters of fragrant flower-heads. We soon penetrated the pinewood that came close to the eastern shore of the Kissimmee and emerged on the Okeechobee Prairie. Then the question that often occurred to us was brought to mind again: Why are prairies? Answer?

Again there is an area of pine trees about Okeechobee City and the remains of the primeval hammock about the lake. The soil, too, is primeval. The rich humus has been accumulating for ages, protected by giant trees both from fire and from any depleting effects of much herbaceous growth. The arboreous growth was too dense for much herbaceous vegetation to thrive. When the trees are removed and herbs get a chance to grow, they luxuriate and we find small forests of thistles (*Cirsium*) twice as high as one's head, forests of poke-weed over twice as high. This hammock is the home of the moon-vine (*Calonyction*), which is so rampant that it smothers whatever plants it overruns. Its almost luminous myriads of corollas at night set against the dark green leaves form a sight at once weird and unique.

The following morning we drove down through the pinewoods paralleling the lake hammock several miles distant, passing the site of Zachary Taylor's celebrated encounter with the Indians during the Seminole Wars, and thence over the old Jupiter trail to Hungry Land and the eastern coast. This is normally a wet country, but then it was the plants characteristic of dry soil that appeared in bloom, the lavender morning-glory (*Ipomoea sagittata*), the pine-hyacinth (*Viorna Baldwinii*), and the piriquita (*Piriquita tomentosa*). The hammocks of the tributaries of the Jupiter River, a mixture of broad-leaved trees and cypress, supported a copious growth of two kinds of wild-coffee, both in flower and in fruit. The one kind had white flowers and few large red fruits (*Psychotria undata*), the other greenish flowers and numerous small orange or red fruits (*P. Sulzneri*).

On the way down the eastern coast the advantage of the fire-resisting shrubs and herbs, *i. e.*, those with horizontal underground stems, over those with merely taproots, was evident. The former showed less wilting and less loss of leaves than the

latter. Plants like the gopher-apple (*Geobalanus*) and the milkworts (*Polygala*) exhibited no effects of the long drought.

From Miami to Cape Sable

At Kelsey City our party was augmented for several days by Fannie C. Rane. We reached Miami in the evening and the next morning set out for the Cape Sable region by land. For the distance of twenty-odd miles southwest of Royal Palm Hammock and Long Key there is almost flat prairie. Its principal herbaceous growth is saw-grass (*Mariscus*). There is often a scattered growth of pond-cypress (*Taxodium*) and of red-mangrove (*Rhizophora*) and scattered dense hammocks of a mixture of temperate and tropical trees. Several of these hammocks, which are flooded part of each year, harbor a kind of *Zamia* that occurs nowhere else in Florida. It may be a West Indian species. In and about these hammocks are cabbage-trees (*Sabal*) and saw-palmetto (*Serenoa*). These palms, however, decrease in abundance about half way from Royal Palm Hammock to Cape Sable and their place in palm growth is taken by the beautiful saw-cabbage palm (*Paurotis*),[1] a plant of very different habit and aspect from any other of our fourteen kinds of palms.

About West Lake where the road crosses from Dade County into Monroe County, maritime plants abound—sea-oxeye (*Borrichia arborescens*), saltwort (*Batis maritima*), together with Christmas-berry (*Lycium carolinianum*) and a score of other shrubs and herbs. There we discovered the little sea-purslane (*Sesuvium maritimum*)—an addition to the flora of the Florida mainland. Blodgett's potato-shrub (*Solanum Blodgettii*), which a little further inland grows knee-high, there grew nearly twice as high as one's head and was laden with its pink flowers and red berries. The wild cotton (*Gossypium*) grew throughout the low hammocks; its branches were often almost vine-like and bore countless flowers which open white or pale-yellow and soon turn to a deep-pink, and also bolls from which the fluffy cotton often hung loosely and fell to the ground.

The higher land and the proximity to the Bay of Florida was indicated by the presence of many mahogany trees (*Swietenia*) and other high hammock plants.

[1] Journal of The New York Botanical Garden 23: 61–70.

In the Cape Sable region.—Where the vast prairies back of Northwest Cape narrow down and are flanked by hammocks —white-mangrove on the right, soapberry on the left. The whole region is of marl and is elevated but little above tide. Centuries ago there was much aboriginal activity there as is evidenced by mounds, kitchen-middens, burial mounds, and canals. The southern limit of the Ten Thousand Islands may be seen in the distance.

In both the high hammock and the low hammock vines were rampant. Ten different kinds were abundant; hippocratea (*Hippocratea*), morning-glory (*Ipomoea*), moon-flower (*Calonyction*), rubber-vine (*Rhabdadenia*), milkweed-vine (*Philabertella*), grape (*Cissus*), hemp-weed (*Mikania*), wild-allamanda (*Urechites*) and devil's-claws (*Pisonia*). The entanglements were so dense that progress through the hammocks was very slow and laborious, and additional trouble was added in the low hammocks by the ever-present, often epiphytic, cacti, dildo (*Acanthocereus*), prickly-apple (*Harrisia*), and prickly-pears (*Opuntia*).

Several epiphytic orchids that grew abundantly in both the high hammocks and the low hammocks were beginning to bloom. The two larger kinds, the butterfly-orchids (*Oncidium undulatum* and *Cyrtopodium punctatum*), were the more showy. The former has an elongate—two feet or less—pseudobulb, bearing narrow, thinnish, plaited leaves, and a flower-stalk four feet long or less; the latter has a very small pseudobulb which bears broad smooth leaves, in texture resembling sole-leather, and a flower-stalk eight feet long or less.

While returning over the prairies beyond the influence of salt-water, we found one of the objects of our special search—a spider-lily or alligator-lily, with several soap-scented flowers with white sepals on each scape. It belonged to a group quite different from the one found in the Devil's Garden on the opposite side of the State, which has a single fragrant flower with green sepals on each scape.

Here it may be of interest to refer briefly to two specialties of the excursion.

Dr. Kelly, driven by an old penchant, was continually looking for snakes, and he has furnished the following data concerning the various serpents collected on the Florida peninsula:

The two more closely related branches of the animal kingdom are particular friends of vegetation. The one, nature's most graceful creatures of the air, the most universally loved animals —the other, nature's most graceful creatures of the land—the most universally shunned animals—or respectively, *birds* and *snakes*. They destroy many other kinds of animals whose methods of life are inimical to plants and which, in some cases, if uncontrolled, would prove fatal to their existence.

The climate of Florida is in every way admirably adapted to snake-life; there is an abundance of water, moisture, protective vegetation and geology, and food. Water-snakes especially abound; in the genera *Natrix* and *Seminatrix*, which contain fifteen species all told, eight occur in Florida. There also we find the huge diamond-back rattlesnake, and there, too, the beautiful little, but more deadly, elaps abounds. Out of about one hundred and fifty-four species of serpents known to occur in North America, forty-five occur in Florida, or, perhaps, about fifty per cent. more than in any other State of the Union.

We did not, however, actually observe many kinds of snakes in the field, as the season was backward, but here and there in all parts of the State where the highways are much used by automobiles we noticed snakes that had been killed on the road, as well as a variety of other small animals, including even the gopher-tortoise. It is fortunate for the preservation of animal life that the tourist season passes before nature fully awakens from the winter's rest. In almost all the fresh-water we saw snakes of the genus *Natrix*, species not identified, but resembling our northern water-snake (*Natrix sipedon*). Out of the forty-five native species, fourteen were captured alive.

However, snakes were a side issue, for Dr. Kelly devoted most of his time to collecting lichens which were forwarded from time to time for determination and study to Professor C. C. Plitt, who reports that: One is impressed with the great number of bark-inhabiting, especially bark-encrusting, lichens. Of course, this does not mean that a great many more of other kinds are not likely to be found there, but it does mean that bark lichens are very conspicuous. Thus, of more than a hundred species thus far determined, five only—four species of *Cladonia* growing on soil and one, *Opegrapha*, a rock-inhabiting form—were found on substrata other than bark. The large percentage of crustose forms is surprising, for more than sixty per cent. are crustose, and the percentage will be even greater when all the specimens are determined. A large percentage of species are found to be common to the West Indies and the Bahamas.

The striking blood-red *Chiodecton sanguineum* was collected in quantity, but all the specimens were sterile. It seems very probable that fruited specimens are not to be found in Florida.

A pleasant surprise was a small bit of *Dictyonema sericeum*. This lichen occurs in the mountains of Jamaica, at an altitude of 5,000 feet, where it grows in profusion. The Florida specimen is not large, and it has the appearance of having grown under rather unfavorable conditions.

What an interesting conflict is presented on many of the pieces of bark, especially on those from the Florida Keys. On a small piece only a few inches square may be found a number of species and genera encroaching upon one another. Species of *Graphis* and species of *Arthonia* are most frequently the contestants, but they do not always have the field to themselves, and one is not surprised to find in among them a *Pertusaria*, or a *Lecanora*, or a *Bacidia*, or, for that matter, a *Trypethelium*, or an *Ocellularia*, or a *Buellia*. In fact, there is no assurance of what species one is likely to find growing together in the most confusing intricacy. Sometimes they are so hopelessly entangled that it is impossible to tell their exact boundaries, or whether some of the fruits are not on foreign thalli.

As already stated, there still remains much work to be done, for which reason any report now given would be only provisional, yet it is of much importance and highly interesting to note that the following genera are each represented by three or more species: *Arthracothecium*, *Arthonia*, *Bacidia*, *Buellia*, *Cladonia*, *Graphis*, *Lecanora*, *Leptogium*, *Ocellularia*, *Opegrapha*, *Parmelia*, *Pertusaria*, *Pyxine*, *Ramalina*, and *Trypethelium*.

From Miami to the Saint Mary's River

After several days' study in the cactus plantation at Buena Vista and in the collections at Cutler, we started up the eastern coast with the mouth of the Saint John's River, Fernandina, and Saint Mary's as our objectives. We were soon at the most eastern part of Florida—Lake Worth—, which is in the same longitude as Charleston, and also that of James Bay, Canada, and Grant Land to the north, and the Panama Canal, and the most western point of South America to the south. On the sand-dunes between Lake Worth and the ocean we found the snowberry (*Chiococca*) growing as an erect shrub instead of a vine, which is its normal habit. The continued drought still delayed the advent of spring, as far as flowers were concerned. No one would have suspected that we were in the "Land of

Flowers." However, a few of the deep-rooted plants were flowering in spite of lack of surface water. Colonies of the rose-purple mallow (*Hibiscus furcellatus*) lent the most color to the vegetation in the vicinity of the estuary of the Saint Lucie River. Northward where marshes and hammocks divided the "scrub" from the pineland the sweet-bay (*Magnolia*) and the Loblolly-bay (*Gordonia*) had unfolded their showy white flowers.

Further observations on the variations in the "scrub" seem to have discovered the reason for the occurrence of the Caribbean-pine (*Pinus caribaea*) in that plant-association instead of the normal spruce-pine (*P. clausa*). The spruce-pine is quite inflammable and tender. A fire sweeping through the "scrub" greatly depletes the original often copious growth of spruce-pine. Sooner or later this pine disappears from the fire-swept area. Thus we often find areas of "scrub" devoid of pine trees. Of course, such areas may be reforested with spruce-pine from seeds blown in from undamaged areas; perhaps some parts of the "scrub" now covered with spruce-pine may represent such reforested areas. But there are many parts of the scrub with the Caribbean-pine. This pine is practically fire-proof, so to speak, and doubtless supplanted the spruce-pine in areas where the latter could not maintain itself.

About half way up the eastern coastal region a milk-pea (*Galactia Elliottii*) is very abundant. In several towns in that region we noticed lawns composed almost wholly of a growth of this pea. The roots are deep-seated and the stems and leaves are nearly prostrate. Thus it is adapted to growing in sandy soil, and in the proper season it produces large quantities of soft white flowers. There, too, we came into the region of the lead-plants (*Amorpha*) and sumacs (*Rhus*). These two woody plants have pinnately compound leaves and continue to flower after they have begun to mature their fruits, and there they are often very ornamental. Associated with them was quite frequently another compound-leaved naturalized shrub (*Sesban punicea*), which bears drooping clusters of scarlet flowers which also continue to unfold after the plant has matured some of its pods. We now entered a region where the cabbage-tree (*Sabal*) and the saw-palmetto (*Serenoa*) grow intimately intermixed. One interesting, yet unsolved, problem suggested by these two palms

is, why does the cabbage-tree grow erect while the saw-palmetto grows prostrate?

We were soon back in the Mosquito Inlet region, which in the matter of the geographic distribution of orchids is interesting because it represents the northern limit of the tropical epiphytic type (*Encyclia tampense*) and the southern limit of the temperate type (*Auliza conopsea*). In the vicinity of Halifax Creek, north of the Halifax River and south of the Mata-Compra Haulover, we located the northern limit of the coontie (*Zamia umbrosa*) along the eastern coast. As far as we now know, this zamia is most abundant at the northern edge of its geographic range. At Perseverance Ranch near Ocean City, we were informed that throughout the winter thirty crates of leaves of this zamia had been shipped daily to northern cities for making floral decorations.[1]

Thence we made haste to reach the northeastern corner of Florida, as the country was still a green desert, and not a "painted desert," by a profusion of highly colored wild flowers, as it should have been.

The early afternoon found us at the mouth of the Saint John's River and at the same time in a geographic center of prickly-pears (*Opuntia*). We visited Pilot Island and Fort George Island, both on the northern side of the Saint John's estuary. Then we made notes of the several undescribed species of *Opuntia* and secured flowers from the plants we had gathered fruits from the preceding winter.[2] We next dropped back to the sand-dunes about Atlantic Beach, which form a vast natural prickly-pear garden, comprising three species. Acres were literally covered with these cacti. Two kinds were in flower: the one an erect bushy plant with large firmly attached armed or unarmed joints; the other closely prostrate with viciously armed loosely attached joints. The plants of all three are much branched and very floriferous—scarcely equalled in this respect by the floriferous forms of *Opuntia Dillenii*. The extensive areas of the flatter parts of the sand-dune, clothed with prickly-pears almost to the exclusion of other conspicuous vegetation, was a unique sight to behold in our eastern states.

[1] Journal of The New York Botanical Garden **22**: 121–137.
[2] Journal of The New York Botanical Garden **24**: 16–23.

The following day was devoted to localities north of Jacksonville. We proceeded to Yulee and then branched off toward the east to Amelia Island, which forms the northeastern extremity of Florida. There we secured the flowers of our largest-jointed eastern prickly-pear from the plants from which we secured the fruits the previous winter.[1] The flowers are the largest of all of our eastern prickly-pears. In and about Fernandino a heliotrope relative—*Cochranea anchusaefolia*—grew all over the roadsides and vacant lots, just as *Phlox Drummondii* does in many of the inland towns. It is also common in the seacoast towns of Georgia. On the sandy hammocks about the town we found a great deal of a cock-spur prickly-pear (*Opuntia Tracyi*) in flower. In this species the flower and the joint from which it arises are wholly out of the usual proportion. The flower-receptacle alone is often nearly as large as the joint.

Returning to Yulee, we continued northward with Saint Mary's as our objective. We traveled on the Dixie Highway. In its northern extremities this road had better be called the "Nixie" Highway. However, we got through and finally achieved our destination. On the way we noticed a peculiar flag (*Iris*) in the swamps. Its sepals were dark-purple, except the yellow and white bases; the petals were purple, except the white-margined bases, and the three styles were purple with reddish margins.[2] Associated with the flag was a water-willow (*Dianthera*) with pale-violet flowers. A few kinds of flowering plants adorned the pinewoods; fewer than a dozen kinds were much in evidence, some with decided color in their flowers, others neutral in coloring. The latter were represented by the black-root (*Pterocaulon*), white-topped aster (*Doellingeria*), and lobelia (*Lobelia paludosa*). Yellow was nearly everywhere evident through the flowers of colic-root (*Aletris*), St. Peter's-wort (*Ascyrum*), and milkwort (*Polygala lutea*). Deeper color was prominent in the low pinelands through the skullcap (*Scutellaria*), the grass-pink (*Limodorum*), and the snake-mouth (*Pogonia divaricata*). The last-named plant was present by the acre and was the most interesting of all those cited above, for it is the only one that ranges from sea-level to the top of some of the higher

[1] The Journal of The New York Botanical Garden **24: 22.**

[2] Specimens have flowered at The New York Botanical Garden and seem to represent a new species.

mountain peaks. Its flower has less color in the lowlands than it has in the mountains. Saint Mary's was well decorated with wild flowers. The most conspicuous one was a kind of tick-seed (*Coreopsis*) which filled backyards, vacant lots and streets with shimmering islands of bright yellow. The Mexican-poppy (*Argemone intermedia*), with its large clear-white flowers, was common on roadsides. A remarkable carpet of Saint Augustine-grass (*Stenotaphrum*) clothed the wide (100-foot) streets[1] and sidewalks. Mixed with the grass were myriads of pale-blue stars, the flowers of a blue-eyed grass (*Sisyrinchium rosulatum*), whose habit of growth is radial as well as its flower parts, and the stems and leaves are closely prostrate. A few years ago this plant was known only from Charleston, South Carolina, and Mobile, Alabama. Green was dominant everywhere. Besides the carpet of Saint Augustine-grass, the giant live-oaks and hickories, which are more numerous than the houses, had put forth their new foliage.

Saint Mary's is an old town and formerly was of much importance. It was founded several centuries ago. The following description of it and of its inhabitants, printed before the year 1700, is of interest:

"An hour before Sun-set we got to the town call'd St. Mary's. This was a Frontier and a Garrison Town; the Inhabitants are *Indians* with some *Spanish* Soldiers . . . The Women Natives of these town, cloath themselves with the Moss of Trees, making Gowns and Petticoats thereof, which at a distance, or in the Night, looks very neat."[2]

The present inhabitants do not use the Florida-moss for clothes, but do continue its use in their domestic economy by feeding it to cows and chickens.

We searched the hammocks about Saint Mary's for a hop-trefoil (*Ptelea Baldwinii*), said to have been collected at Saint Mary's over a hundred years ago. We did not rediscover it, but did find a dogwood (*Svida*) different from any species of that genus before collected.

[1] Journal of The New York Botanical Garden **24**: 19.

[2] William Dickenson, in a book entitled, "God's Protecting Providence, Man's surest help and defense, . . . evidenced by the remarkable deliverance . . . from the devouring Waves of the Sea, . . and also from the cruel devouring Jaws of the inhuman canibals of Florida," page 107.

Upon returning to Jacksonville we took the train for New York. Some rain fell, perhaps the last for the spring and the summer, for an almost unprecedented drought during the remainder of the year afflicted the southeastern States, and water plants were rampant only where enough water had collected to temporarily support them.

In the low pinewoods two plants with spiked flowers had sprung up: the one, a yellow-flowered colic-root (*Aletris lutea*) with spirally arranged flowers; the other, a white-flowered ladies'-tresses (*Ibidium cernuum*) with spirally twisted spikes. The river-swamps were a riot of greens. The various shades of green were caused not only directly by the variation in the leaves, but by the placing of the leaves. Thus the leafage as arranged on the branches of trees of different genera and families appeared fluffy, stringy, tiered, or massed. The wet ditches in the Carolinas were over-grown with lizard's-tail (*Saururus*), pickerel-weed (*Pontederia*), and flags (*Iris*), while in Virginia only flags (*Iris prismatica*) appeared. The only abundant herb in the higher lands was a southern ragwort (*Senecio Smallii*), while less abundant but widespread was a pinkish beard-tongue (*Penstemon*). The intermediate ground was often covered with another yellow ragwort (*Senecio*) and thickets of brambles (*Rubus*), all of which were past flowering in peninsular Florida about two months earlier.

The various kinds of pine trees which had put forth their new erect branches, often to the length of six or eight inches, resembled conventionalized gigantic Christmas-trees with numerous candles (new branches). In some open areas seedling pine trees had sprung up almost as thick as stubble, showing how readily and how thickly the barren tracts might be reforested if fire could be prevented from running over them. In other places similar reforestation was being accomplished, naturally, but with the original stand of seedlings evidently much depleted by fire; the surviving trees were now grown sufficiently large to be little damaged by fires.

All this brings to mind the doleful side of our recent experiences in the Florida peninsula. The drought already referred to had made much more tinder than usual and fires were very numerous. Every day we passed through recently burned areas or through fires raging in prairies, in pinelands, and in hammocks. Each

fire destroys either deposits of humus or humus in the sand which is already an impoverished soil. Such fires, if frequently repeated, will transform the Florida peninsula into a desolate waste and not as we found it in the spring of 1921, a Green Desert.

JOHN K. SMALL

PUBLIC LECTURES DURING OCTOBER

Oct. 6. "The Ancestral History of Some Existing Plants." Dr. Arthur Hollick.
Oct. 7. "Perfumes, Natural and Synthetic." Prof. M. T. Bogert.
Oct. 13. "Autumn Coloration." Dr. A. B. Stout.
Oct. 14. "Botanizing in the Colombian Andes." Prof. T. E. Hazen.
Oct. 20. "Plants in Relation to Environment." Prof. G. E. Nichols.
Oct. 21. "European Gardens." Mr. J. C. Wister.
Oct. 27. "Botanizing in British Guiana." Dr. H. A. Gleason.
Oct. 28. "The Evolution of the Lantern Slide." Mr. A. T. Beals.

PUBLIC LECTURES DURING NOVEMBER

Attendants upon the Saturday and Sunday afternoon lectures are asked to bear in mind a change in the hour, the November lectures occurring at 3:30 instead of 4 o'clock. The lectures are to be delivered in the Lecture Hall of the Museum Building. They are illustrated by lantern slides and otherwise and are free to the public.

Nov. 3. "Mountain Scenery of the United States and Mexico." Mr. LeRoy Jeffers.
Nov. 4. "Rare Pines and Firs." Mr. K. R. Boynton.
Nov. 10. "Botanical Rambles in Panama." Dr. M. A. Howe.
Nov. 11. "The Origin of Cultivated Plants." Dr. A. B. Stout.
Nov. 17. "Ferns." Dr. R. C. Benedict.
Nov. 18. "Java and the Javanese People." Dr. H. A. Gleason.

Nov. 24. "A Trip to Ecuador." Dr. F. M. Chapman.
Nov. 25. "British Guiana." Miss Ruth Rose.

ACCESSIONS

Plant and Seed Accessions

97 *Dahlia* roots, 55 varieties. (By exchange with Dr. Marshall A. Howe.)
60 *Dahlia* plants, 30 varieties. (Given by R. Vincent, Jr., & Sons.)
45 *Dahlia* roots, 23 varieties, and 13 *Dahlia* plants, 7 varieties. (Given by Dahliadel Nurseries.)
37 *Dahlia* plants, 20 varieties. (Given by Mr. John Magee.)
34 *Dahlia* roots, 17 varieties, and 2 *Dahlia* plants, 1 variety. (Given by Babylon Dahlia Gardens.)
28 *Dahlia* roots, 17 varieties. (Given by Mills & Co.)
18 *Dahlia* roots, 9 varieties, and 4 *Dahlia* plants, 2 varieties. (Given by Mr. Wm. Jost.)
18 *Dahlia* roots, 10 varieties, and 2 *Dahlia* plants, 2 varieties. (Given by Meachen & Sherman.)
18 *Dahlia* roots, 12 varieties. (Given by Slocombe's Dahlia Gardens.)
17 *Dahlia* plants, 14 varieties, and 3 *Dahlia* roots, 2 varieties. (Given by Stewart & Fisher.)
16 *Dahlia* plants, 8 varieties. (Given by Mr. W. H. Waite.)
13 *Dahlia* plants, 8 varieties, 2 *Dahlia* roots, 1 variety, and 1 clump of *Dahlia* roots. (Given by Mr. W. N. Corby.)
12 *Dahlia* roots, 12 varieties, and 7 *Dahlia* plants, 4 varieties. (Given by Mr. C. Louis Alling.)
12 *Dahlia* roots, 12 varieties. (Given by Mr. Geo. L. Stillman.)
9 *Dahlia* roots, 6 varieties, and 6 *Dahlia* plants, 3 varieties. (Given by Prof. Geo. W. Fraser.)
9 *Dahlia* plants, 8 varieties. (Given by Mr. Richard C. Colt.)
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Vol. XXIV November, 1923 No. 287

JOURNAL

OF

The New York Botanical Garden

EDITOR

H. A. GLEASON

Assistant Director

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PRICE $1.00 A YEAR; 10 CENTS A COPY

PUBLISHED FOR THE GARDEN

AT 8 WEST KING STREET, LANCASTER, PA.

INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

VOL. XXIV November, 1923 No. 287

BOTANICAL FEATURES OF MOUNTAIN LAKE, VIRGINIA

A brief vacation in July, 1923, was spent by the writer among the mountains of southwestern Virginia, mostly in the vicinity of Mountain Lake. This attractive spot was reached by stage from Pembroke, on New River, a distance of eight miles, and the latter half of the journey was made on a steep mountain road. The surface of the lake is 4,500 feet above sea-level. If the mountain were a man, seated and facing northward with his hands clasped across his knees, the lake would be in his lap and overflow where his fingers joined; while the head, represented by Bald Knob, would rise 500 feet higher at the southern end.

This beautiful little lake was discovered in 1751 by a party of surveyors under Benjamin Gist, who reported it to be three-fourths of a mile long and about one-third that distance across. The mountain was long called Salt Pond Mountain by the old settlers, who salted their cattle in the little valley there before it filled and formed a lake. At its deepest point, the basin of the lake measures about 125 feet, and some of the old hemlock trees which grew in the valley years ago may still be seen standing in its clear and quiet depths.

It is customary among the uninformed to account for the existence of lakes near the summits of mountains on the theory of underground connections with higher, distant mountains; but, if one will carefully study the environment of such a lake, he will usually find ample water supply close at hand without resorting to untenable methods of explanation. The evaporation is less near the mountain tops, the summers shorter, the rain and snow more frequent, humus abundant, and there are often deep gorges where the winter's ice will linger far into the summer.

A few springs will be sufficient to maintain the level of a mountain lake of this character and the regular rains will provide for its overflow. In the case in question, several very cold springs feed the lake at its southern extremity and a large one is located on its eastern bank, from which water is piped to the hotel and cottages.

At the time of my visit, July 10–17, the shores of the lake were fringed with giant rhododendrons in the very pink of perfect bloom. The trees grew in dense thickets mixed with mountain laurel, which had just finished flowering, and through these tangles trails had been opened up entirely around the lake. The view, however, was finer from a canoe or row-boat on the water, with the added charm of reflections.

In addition to the rhododendron and mountain laurel, several other trees attracted my attention, among them immense and ancient hemlocks, splendid specimens of the rare Alleghany birch, and several fine examples of the mountain holly, which drops its leaves in the autumn. Considerable chestnut timber also remains on this mountain,—although the chestnut canker has begun to creep up the valleys,—and the trees were loaded with blossoms while I was there. Indeed, the first thing I noticed on reaching the base of the mountain was the peculiar, faint fragrance of the chestnuts, which I had not enjoyed for many years.

The forest floor about the margin of the lake, which is deeply covered with rocks and moist humus, yields a wealth of shrubs, ferns, and herbaceous flowering plants which should be visited several times during the season. I saw the leaves of many fine orchids, but the flowers had all disappeared. *Lycopodium lucidulum*, one of the club-mosses, covered the ground in the greatest profusion near the large spring on the eastern side; while the red berries of the partridge-berry vine still clung to many stems of this attractive little lover of the cold. By another spring nearer the hotel, I found the white wood-sorrel, *Oxalis Acetosella*, in bloom just as I saw it there first twenty summers or more ago.

In this quiet, virgin forest the birds loved to gather, and most of them were apt to be found near the water about daybreak. Robins, thrushes, catbirds, crows, goldfinches, woodpeckers, nuthatches, chewinks, warblers, and juncos were much in evi-

dence. The juncos even played the part of sparrows, hopping and chirping about the hotel in a very sociable way with worms in their mouths for their young, which were in nests under the porches. This is considered a southern variety of the snow-bird,—nesting in the high mountains of Virginia and North Carolina rather than take the long journey toward the pole in summer,—but I saw little to distinguish it except its extreme sociability. The common northern junco is said to breed from the tree limit in Alaska to the mountains of Pennsylvania, building its nest of moss or grass on or near the ground, and occasionally near houses.

Robins and catbirds rivaled juncos in abundance near the houses. A nest of young robins on a chestnut limb by my window gave me an excellent illustration of industry and devotion. When it rained, the mother bird would stand on the limb and spread her wings to shield her little ones from the storm. The chickadee was as rare there as he has been in New York this year; and I saw only a single pair each of wrens, bluebirds, and phoebes. Mockingbirds do not get into that part of the mountains; occasionally I have noticed them in pairs as far west as Blacksburg, at an elevation of 2,200 feet.

Plants are protected from the ravages of insects by birds. What do birds get from plants? Food, protection, and suitable places to build their nests. Many birds mix with their insect diet a large proportion of vegetable food when it is in season. At Mountain Lake, there was plenty of such food: the fruits of the shadbush, bird cherry, wild black cherry, and various species of viburnum; huckleberries, blueberries, elderberries, thimbleberries, raspberries, blackberries; and the berries of many wild herbaceous plants better known perhaps to the birds than to ourselves.

Bald Knob

My first visit to the Knob was made at five o'clock in the morning to see the glory of the sunrise. No other view in the East appeals to me more strongly than this, because it is so wide-spreading and so unobstructed in every direction. The mountain ranges look like green billows of a mighty ocean and the fog that fills the valleys at dawn looks like the foam. Landmarks in five states are easily visible from this elevation on a clear day.

After two or three trips to the summit, both by the steep trail and the more winding road, I became acquainted with most of the plants on that side of the mountain. The season of flowering corresponded quite closely with that of Lower Twin Lake near Central Valley, New York, at 800 feet elevation, which locality had been visited the previous week; and many of the plants were the same.

The first plant to attract my attention was *Dalibarda repens*, the leaf of which is heart-shaped and lies flat against the ground, reminding one of a violet. The flowers of Dalibarda as well as most violets had disappeared, but *Viola striata* still showed blossoms. Medeola was just coming into flower, and each large plant was the center of a colony of smaller ones from the seed of former years. The roots of this plant are very white and crisp and taste much like a cucumber. Jack-in-the-pulpit, Solomon's seal, false Solomon's seal, two-leaved Solomon's seal, twisted stalk, Clintonia, and several species of trillium were all in fruit.

Lily-of-the-valley, long past flowering, grew very large here and in the rich soil about the lake, mixed in with other vegetation and not forming mats as it does in cultivation. I have seen the wild form only on a few mountain tops, usually on the north side where it is cool and moist. *Galax aphylla* was abundant and in flower in the sandy soil near the summit, its rounded shining leaves and milk-white flower clusters being very conspicuous. The farmers of the region call it "colt's-foot" because of the shape of the leaves, but it is wholly unrelated to the true *Tussilago*, with yellow flowers. From Galax, Virginia, and various other localities, large quantities are shipped to New York every winter for the use of florists.

Of the milkweeds seen, by far the most abundant was *Asclepias exaltata*, a wood-loving species much more robust than *A. guadrifolia*. A great patch of this plant was found about halfway up the trail in a rich, shaded spot, where the stalks reached five feet or more in height and were covered with greenish blossoms. Nearby were flowers of the horsemint, also common, and a pretty clump of *Heliopsis helianthoides*, looking for all the world like a wild sun-flower two or three inches in diameter. *Eupatorium purpureum*, a common weed of the meadows, seemed out of place in this company and at this elevation.

The wood lily, with an erect flower, is earlier than the Canada lily, with a few nodding flowers at the top of a tall stem. This latter species was just coming into bloom at the time of my visit, and I caught glimpses of small patches of it scattered through the undergrowth near the summit. The tall spikes of *Cimicifuga racemosa* were also frequently seen, vying with the Galax in their snowy whiteness. Other flowers of this feathery character were *Tiarella cordifolia*, two species of *Spiraea*, three species of parsley, the common yarrow, the pretty little stonecrop, *Sedum ternatum*, so abundant everywhere on the rocks, and the wild hydrangea, *Hydrangea arborescens*, an attractive plant of shrubby growth.

The carrion-flower, *Smilax herbacea*, had changed its ill-scented flowers for clusters of rounded berries and the queer, winged fruits on the wild yam, *Dioscorea*, had almost reached full size; while quantities of fly-poison, *Chrosperma muscaetoxicum*, bearing conspicuous clusters of greenish-yellow blossoms, had just come into full flowering and was one of the commonest plants seen on the summit.

Another very common plant was the whorled loosestrife, with small yellow flowers and leaves in whorls of four or five. The spreading dogbane, *Apocynum*, had small pinkish flowers, while the flowers of the fire pink, which was fairly common, were a brilliant crimson. Contrasted with this deep color, were the pale, waxlike clusters of shin-leaf and Indian pipe. Wintergreen, arbutus, and wood betony were everywhere, but not in bloom; the flowers of wild azalea, the flame-colored azalea, New Jersey tea, and Indian physic were nearly gone; and those of horse balm, coreopsis, aster, and goldenrod were still to come.

Near the summit, I saw a good specimen of the wild cucumber tree, *Magnolia acuminata*, and a small one of the moosewood, or striped maple. In shaded places, the mountain laurel and *Rhododendron maximum* were still blooming, while the exposed top of the mountain, well named Bald Knob, was covered with a low, dense growth of scrub oak, black gum, witch hazel, sassafras, beech, chestnut, shadbush, birch, mountain ash, alder, bird cherry, azalea, hobblebush, blueberry, huckleberry, cowberry, gooseberry, catbrier, and bracken fern, among which herbaceous plants of various kinds appeared. The average height of this

tangle of vegetation was about two or three feet; but just over the top, where the soil was cool and moist, the mountain ash and Alleghany birch attained almost normal proportions. *Viburnum cassinoides* was found in fruit growing on the very summit, where sufficient soil had collected to support quite a colony; and among the great masses of sandstone about the summit were the blue flowers of *Scutellaria saxatilis* and the feathery, white flower clusters of the rare *Hydatica petiolaris*, which is seen only on certain mountain tops.

Vegetation on Mountain Summits

The plants found on mountain tops are apt to be peculiar in kind and character because of the peculiar conditions under which they exist. The soil is usually sandy and poor; the temperature high during the day and low at night; the winters extremely cold and the summers hot; the light intense; and storms of all kinds most violent. During the summer, plants are protected by the clouds and in winter by a layer of snow. Indeed, it often happens that the height of mountain plants is determined by the depth of the snowy covering. Growing under these peculiar conditions for thousands of years, plants become adapted to them and acquire certain characteristics that enable them to endure extremes. It is only when we try to grow alpine plants in rock gardens that we find how difficult it is to duplicate such conditions at low elevations.

Another Fine View

About a mile west of the lake is a rocky precipice, from the brink of which one can look down over the valley of New River nearly three thousand feet below. A pretty little log house has been built on this ledge, the veranda of which rests on the very brow of the cliff. The trail to this spot first passes a bed of Devonian fossils, where shells imbedded in soft shale carry the mind of the geologist back to a period about 170 million years ago, when all of these formations were beneath the ocean. The remainder of the walk was through the woods, where many of the plants already mentioned were again seen, together with a number of brilliantly colored fleshy and woody fungi, such as *Russula*, *Lactaria*, *Chanterel*, *Boletus*, and *Polyporus*, a list of

which will be published elsewhere. On a decayed chestnut log, I saw about forty pounds of excellent food going to waste in the shape of the sulphur-colored polypore, which appeared in several beautiful clusters on the top of the log.

Space will not permit me to describe the Cascade, five miles to the north of the lake, where Little Stony Creek plunges over a precipice ninety feet in height; nor many other interesting places in this remarkable region. I simply wish to mention, in closing, a delightful walk toward the south along the road to Newport and Blacksburg, where there is a very cool spring which all tired, thirsty travelers remember. About it are huge sandstone blocks broken from the framework of the mountain, and these I found covered with large green lichens which become black and leathery when old. It is said that arctic explorers have sometimes eaten them instead of shoe leather and thus prolonged their miserable lives.

Overhanging one of these sandstone rocks in a very graceful way was a clump of the purple flowering raspberry, or thimbleberry, which grew more abundantly at the Cascade, while a few plants of alum-root, *Heuchera americana*, occupied a ledge on the shaded side of the rock. The long-leaved Houstonia, a southern relative of our little bluets, was seen in flower in many places, and the tall, stiff stems of *Campanula americana* were occasionally noticed, bearing large blue, bell-shaped flowers fastened rather closely to the stalk. This sessile character was more accentuated in the smaller flowers of *Specularia perfoliata*. Other plants noticed in flower were *Hydrophyllum virginicum*, *Rosa virginiana*, the wild geranium, the yellow star grass, the blue-eyed grass, and *Tradescantia virginica*, or day-flower.

It was interesting to note also the influx of certain weeds along the approaches to this mountain paradise. A weed has for a long time been defined as "a plant out of place," but a recent more explicit and accurate definition is "a non-parasitic, persistently obnoxious plant, growing in cultivated areas," or words to that effect. I think the king devil will readily fall into this category. It is one of the hawkweeds, and I was sorry to see it getting a foothold at Mountain Lake. The orange hawkweed I did not see there, although *Hieracium venosum* was common. The nettle, although persistently obnoxious, could hardly be called a weed when found in its native haunts.

Self-heal, St. John's-wort, evening primrose, viper's bugloss, Indian tobacco, compass plant, cinquefoil, and several other plants usually called weeds were more or less common along the paths and in the open spaces.

W. A. MURRILL

HOW TO HAVE FRINGED GENTIANS

Did you ever, while walking through a meadow on an October day, happen upon a spot where the bluest of blue flowers looked up at you, open-eyed or through fringed lashes?

One late October day, in 1906, while looking for ginseng (*Panax quinquefolium*) in the vicinity of "Round-Top" Mountain, north of Stanwich, Conn., I came upon a meadow where the Fringed Gentian grew in profusion and it brought to my mind that thought of Bryant's:

> "Then doth thy sweet and quiet eye
> Look through its fringes to the sky,
> Blue—blue—as if that sky let fall
> A flower from its caerulean wall."

In the same locality were found growing: Blue Cardinal Flower (*Lobelia syphilitica*), All-heal (*Prunella vulgaris*), Monkey Flower (*Mimulus ringens*), New England Aster (*Aster Novae-Angliae*), Purple Aster (*Aster patens*) and Deergrass (*Rhexia virginica*).

Never having been able to find the Fringed Gentian in my walks about Westchester County, I brought home some of the seed to sow them in a place as near as possible like the one in which they were found growing. Such a spot was found near the corner of Clark Street and Edgewood Avenue in Pleasantville, N. Y. That night a handful of the driest seed-heads were rubbed together between the hands, the numerous tiny seeds caught in paper shoe-boxes and the next morning the seeds were mixed with sand to make them scatter better and sown along a brook.

I did not know the proper time for planting and this sowing of the fresh seed was an experiment on my part, for another lot of the seed was put in a glass fruit can and kept till spring. The seed, sown while fresh, developed into a number of plants, but those that were kept dry through the winter and sown the next spring did not germinate, so far as I could learn. This led

me to believe that the seed must be planted while fresh and this has been proven by trials.

From this planting of some fifteen years ago have been taken many crops of seed which have been planted in different places, suitable for the growth of the Fringed Gentian. The plants have thrived and spread until in the autumn of 1921 hundreds of plants were to be found. The gentians are now most abundant at a distance of about 25 feet from the brook over rather moist land in a part formerly used for gardening purposes. The plants have spread down stream from the site where seed was sown and they are also now found over rather dry knolls some 25 feet above the level of the brook and to some distance from it.

Some of the earlier sowings were made along the brook, beyond the "Swimming Pool" near Pleasantville and after the aqueduct was finished, the seed was sown along that, east of the "Sheltering Arms." While out on walking trips or on autorides in the fall, a few heads have been thrown out in spots which appeared suitable and it has been sown in this way from Bedford Hills to Valhalla, and from Danbury, Conn., to the Hudson River, and in many of these places it is now established.

The result of one sowing is of particular interest. About 1914 seed was scattered in a grassy meadow that is mowed each summer. For several years only a few plants appeared. In 1921 there were probably less than one hundred in bloom. Last fall there were a goodly number of the plants while this fall they form a blue carpet over an area of thirty yards square with several thousand plants in bloom. An interesting fact is that, on account of this field being mowed last August, instead of one main flower stalk springing up from the root there are many short bushy plants with numerous flowers.

For the proper collection of the seed one should wait to harvest the seed-heads until after the first heavy frost, as the seeds do not ripen before that. Gather only the dry-appearing heads and open them on reaching home, for there is a light-brown worm, from ¼ to ½ inch long, which is often present in the seed capsule and eats the seed till it is all gone. Open the capsules carefully in a long, tight, paper box, like a shoe-box, and remove the worm that will probably be found among the seed. The

seed should not be allowed to dry and should be planted as soon after collection as is possible, but if stored in cool damp (not wet) sand or earth during the winter it may germinate if sown early in the following spring.

During the autumn of 1921, I filled a flower pot, one foot high and one foot in diameter as follows: one inch of small stones on the bottom, one inch of gravel above that, next two inches of sand and the rest filled with ordinary garden soil that had been "cooked" in the cellar furnace on a coal shovel. On this I sowed one seed head of gentian on October 28th. This pot rested in an ordinary enameled wash-basin which was kept filled with water and placed in a south window of my office. The little gentian plants germinated well that fall and the rosettes were planted out in the following spring.

I shall be glad to furnish, free of charge, during the autumn a small lot of seed of the Fringed Gentian to any flower-lover who will select a meadow (not a swamp) that will not be burned over nor pastured, and scatter the seed there.

GEORGE F. NORTON

PLEASANTVILLE, N. Y.

CULTIVATION OF THE FRINGED GENTIAN

The Fringed Gentian has been grown successfully from seed by Mrs. Caspar T. Sharpless at Mt. Pocono, Pennsylvania. The seeds were gathered in the autumn, planted at once in a moist shady place and forgotten. Two years later they were in bloom, and a photograph taken from one of these plants showed over one hundred blossoms. Seeds were sent to the New York Botanical Garden, grown in pots at the Propagating House, and planted out last spring, but owing to the exceedingly dry summer have not made a good growth. It is possible that the lack of vitality in the seeds, the sensitiveness to drought, and the presence of insect enemies may partially account for the disappearance of the Fringed Gentian from places where it used to be abundant.

We have recently learned from the outing page of the New York Evening Post, that Major W. A. Welch, General Manager of the Palisades Interstate Park, with the assistance of his staff, is doing his best to preserve and increase some of the wild

flowers which are threatened with extinction. The Fringed Gentian is one of those which is beginning to reappear at various places, where Mr. Raymond Torrey has recently found them.

A PLANT OF FRINGED GENTIAN WITH MORE THAN 100 FLOWERS.

He begs the members of the various tramping clubs to take care not to trample on them, and "trusts that they will not pick this beautiful autumn flower, that it may come back to its old haunts."

ELIZABETH G. BRITTON

THE LOCAL FLORA HERBARIUM

The Local Flora Herbarium of the New York Botanical Garden comprises dried specimens of plants found growing naturally within an area circumscribed by a circle with a radius of about one hundred miles from the island of Manhattan as a center.

The present Local Flora Herbarium has had a threefold origin —a consolidation of three independent collections of plants. With the inception of the Garden, the Director-in-Chief, Dr. Britton, had collections made in various parts of the "hundred mile limit" or the circular area two hundred miles in diameter. These collections were incorporated in both a local flora herbarium and in a public exhibit of the plants growing naturally within a radius of a hundred miles of the city of New York. The latter exhibit is now installed in the swinging frames on the second floor of the museum building. Later on, the herbarium of the Torrey Botanical Club, begun in the early seventies of the last century and containing specimens from the "hundred mile limit" was formally transferred to the Garden by the Torrey Botanical Club for inclusion in the Local Flora Herbarium. To this accumulation have been added miscellaneous specimens collected within the area concerned as far back as the beginning of the last century, miscellaneous specimens gathered by members of the Garden staff who frequently accompanied the field meetings of the Torrey Botanical Club, and all the specimens from the local flora formerly contained in the general herbarium of the Garden.

The earlier tasks of bringing these collections into order devolved on Mr. Percy Wilson and Mr. Norman Taylor while assistant curators at the Garden.

The Local Flora Herbarium now contains about 40,000 sheets, but is still far from complete. It has had little attention until about two years ago, not because of any lack of interest in its development, but because constant and pressing duties occupied the time of all the members of the staff at the Garden.

Recently the appointment of an honorary custodian, with an efficient part-time helper, has made it possible to give more time and thought to this important portion of the herbarium. In the earlier collections are some very interesting specimens from the days when civilization had not exterminated so many species

in and near New York City; as, for instance, some collected in the Elgin Gardens of New York City by Dr. John Torrey in 1818, some in New Jersey also as early as 1818, and some in Astoria, L. I., in 1841. One of the most valued of these earlier specimens is the delicate twin-flower, *Linnaea borealis*, which is yet found in great profusion farther north, but has quite disappeared from this vicinity. The specimen in the local herbarium was collected near New Durham, Hudson Co., N. J., by Louis Menand in 1841. It has been mislaid and was discovered only recently by Mrs. Mitchell, when she was engaged in the effort to identify the handwriting on some old labels, in order to establish the identity of the collector, as they were unsigned.

There are many other species which can no longer be found near New York City, of which we should have no accurate knowledge or record without the collections made years ago by members of the Torrey Club; and there are doubtless others which must be found and preserved, within the next few years, if ever. Excursions in this vicinity are made once or twice a week throughout the year, under the auspices of the Local Flora Committee of the Torrey Botanical Club, and as many as three times in each season longer trips are taken for purposes of instruction and exploration. Often on these trips valuable collections are made. This year the three-day trips projected are to the northern Catskills, to Pike County, Pennsylvania, to the Pine Barrens of New Jersey, and to Eastern Connecticut. On the first of these trips, early in June, the northern orchid, *Ophrys cordata*, was found in Ulster County, N. Y.

The Local Flora region comprises sixty-one counties within a radius of about one hundred miles from Manhattan, including the states of Connecticut and New Jersey and large sections in New York and Pennsylvania. Eastern Connecticut, Central New Jersey, and many other limited areas are scantily represented in the Herbarium. There is need of extensive and intensive exploration within the next few years. With the limited opportunities available this herborizing may be made more productive if it is guided by accurate knowledge of the present contents of the Herbarium. Accordingly, a careful census is being made, together with a systematic arrangement, by states and counties, of the specimens in each species. As a result, consultation is made easy and also the needed information is

obtained in regard to the distribution of each species. Owing to this systematic arrangement of sorting specimens in each species by states and then by counties the casual visitor to the Garden will speedily be able to match successfully any plant-fragment, brought to town for examination, coming from within the 100-mile limit. This would prove quite a boon to the amateur collector were the fact more widely known.

Copies of the map of the Local Flora area, one for each species, have been printed, of convenient size for binding and consultation, on which data furnished by the census will be recorded. In a few years this series, of more than two thousand small charts, will enable a visitor or a worker in the herbarium to learn at a glance the distribution of each species *as represented in the local collection;* and to determine by reference to Taylor's "Flora of the Vicinity of New York" what species, as yet unrepresented, are to be sought for and what localities ought to be explored to make the representation more complete. Thus the census is producing what may well be called a *live* index, for it becomes both a trusty guide and a stimulating companion. The labor now bestowed on it is prompted by true enthusiasm. The result, of lasting value and increasing utility, will justify the meticulous care that is taken to make the records accurate and complete.

H. M. DENSLOW,
Honorary Custodian

EARLY-FLOWERING SHRUBS

The "flowers that bloom in the spring" quotation seems to apply especially well to our garden shrubs. In anticipating during autumn and winter months another season of bloom in the lower landscape, we are only following the lead of the plants themselves, for they have long since been doing that very thing, from the late summer months on. Of the hot summer and early autumn months we expect little in the way of bloom from shrubs, excepting from roses, hydrangeas, buddleias, and the like; but just how large a percentage of our color is gone after June we do not fully realize. From another viewpoint, we are very liable to miss many of our most interesting shrubs, as they will bloom before we are aware. In this connection the

variability of our New York climate causes wide differences in time of flowering from year to year. The following blooming dates for shrubs in the New York Botanical Garden shows this:

	1922	*1920*	*1917*
Cercis chinensis	May 8	May 16	May 25
Spiraea van Houttei	"	"	"
Tamarix parviflora	"	"	"
Aronia arbutifolia	"	"	"
Viburnum tomentosum	"	"	"

The preparation one season for the next season's bloom is a process only secondary in interest to that of actual flowering. It not only gives us all the winter buds to watch and study, but also some hints on pruning and care. Experts say that a majority of our garden shrubs should be pruned in summer soon after flowering, thus allowing the new wood and buds ample time to form for next year, and not cut back in late autumn or winter, leaving only a few inches of young growth for next spring's bloom. Whether the buds, developed in autumn, are terminal or along the sides of the branches, they are protected in various ways, and are ready to start with the first warmth from the spring sun. Some do this to their sorrow, if they encounter that enemy of the peach crop, late frost.

We consider the Japanese witch-hazel, *Hamamelis japonica*, to be our first shrub to bloom. In all truth it should be called a winter bloomer, occasionally showing in January, but usually in the latter part of February, especially if several days of continued cold and snow contrive to keep the rich-yellow, strap-like petals rolled up in bud, even after the first impulse to start, as shown by the open end of the bud. Just a few warm days, such as New York experiences many winters, will suffice to spread wide the calyces, showing their shiny purple-red centers, and unroll the narrow petals. Another shrub whose buds are so nearly ready to open that March usually succeeds in inducing them to bloom is the Japanese cornel, or early-flowering dogwood, *Cornus officinalis*. Similar to the witch-hazel in size, shape, and habit, with flowers of similar color, the abundance with which the small blossoms are born gives us a mass of yellow color at a time when we have as yet no leaves or large

flowers and the grass has scarcely become green. Spring yellows and greens are rich in combination, the first general phase of the park or suburban landscape being one of yellow, with a background of the new green grass. It is maintained for the most part by the forsythias or golden bells. These first yellow flowers are augmented in our fruticetum by corylopsis, with its chains of yellow blooms, *Jasminum nudiflorum*, a forsythia-like jasmine which is tender about New York and needs some protection; and the golden currant with the richest yellow blooms and heaviest fragrance of them all. The latter will be found by visitors from April 6 on, according to the season, as specimen and grouped plants, near the old pines at the north meadow bridge. If the northern end of the Fruticetum is visited, the majority of these early-flowering shrubs may be seen.

Pink and white are the foundation colors of the next seasonal phase at the time of the bridal-wreath *Spiraea* and the red-buds. The Chinese or Japanese red-bud, *Cercis chinensis*, growing 6 to 10 feet high in cultivation, carries hundreds of small round buds in clusters embedded in the bark, along the stems and branches. From April 25 on, favorable weather will bring these out, making a pink mist of bloom where these plants are massed, as in front of the power house near the Third Avenue elevated entrance, or above the northeast corner of the lake north of the museum. The andromeda, *Pieris japonica*, blooms about the same time in the flower gardens near the conservatories, and the American *Pieris floribunda*, called mountain fetterbush, is even more beautiful, opening its nodding clusters of pure white, urn-shaped blooms in April from buds formed nearly ten months before.

It is not always to their advantage for these April flowers to open so early. Our first magnolia, which is such a small, rounded tree that we count it a shrub, and of which we have specimens fifteen or twenty years old in both fruticetum and arboretum, is *Magnolia stellata*, Dr. Hall's magnolia, named for Dr. Hall of Rhode Island, who brought us many of our first Japanese shrubs and trees. From woolly terminal buds star-like fragrant white flowers open, with about twelve sepals and petals so alike that they are not readily distinguishable. If the visitor notices that the edges of the flowers are blackened and dead, it is because the late frosts have caught them.

The month of May fills our grounds with so many flowers of all colors, that we do not have to search for particular groups. On entering the Garden from the Third Avenue elevated entrance, the pearl-bush, *Exochorda racemosa*, greets us, reaching large clusters of large white blooms over the stone-work near the gate. This is a valuable shrub for the small garden, as it carries clusters of flowers on the ends of branches, forming a compact surface of bloom. The walk from this entrance along the south border of the garden has a number of interesting and varied shrubs in bloom at this time. Here may be seen the cranberry tree, *Viburnum Opulus*, the double-flowered yellow kerria, *Spiraea van Houttei*, with long gracefully pendent branches laden with bloom, *Rhodotypos*, with white flowers similar to the mock orange, and later the hawthorns, other viburnums, and fly honeysuckles. The viburnums and snowballs are seen at their best when grouped in masses, as in the southwestern corner of the fruticetum or in the viburnum triangle south of the Museum. One of the earliest and best of these is *Viburnum tomentosum*, one form of which is the Japanese snowball. The leaves of this are rich green, and the long branches carry two ranks of snow-white blooms. The viburnums should be given room to develop into large natural specimens, grouped in large masses.

Another group of early shrubs includes the Lemoine hybrid deutzias, weigelas, and syringas or mock oranges, (*Philadelphus*). These hybrids are more than two weeks earlier than the old types. A planting of them may be seen flanking the Mosholu Parkway entrance on the east, and others in the fruticetum. More color is gained in the month of May by the use of azaleas. The Ghent hybrids, with shades of rose, orange, flame and amber, are represented in our collections by several named varieties, planted in front of Conservatory range 1. Their colors are not duplicated by any other shrubs we have. The purple-red *Azalea amoena*, with its variety Hino-de-giri, is also a heavy bloomer, and in addition holds its leaves all winter.

Nearly all of these shrubs may be seen properly labeled in the fruticetum of the Garden and planted out in other parts of the grounds.

KENNETH R. BOYNTON

WINTER BIRDS OF THE NEW YORK BOTANICAL GARDEN

This list is intended to include the birds that may be found within the Garden limits, a tract of rather less than four hundred acres, during one or more of the winter months, not perhaps in any one year, but in the course of five or six years' observation. First come the birds that may be found both summer and winter, and in the following list the species are arranged, more or less, in the order in which they are most likely to be found through the cold spell, the commoner species being placed first. It should be remembered that the best time for observing any of these woodland species is usually from about an hour after sunrise until ten o'clock or so in the morning.

Birds that may be found throughout the year:

House Sparrow
Crow
Starling
Downy Woodpecker
Blue Jay
Chickadee
White-breasted Nuthatch
Song Sparrow
Mallard Duck
Black Duck
Wood Duck
Sparrow Hawk
Hairy Woodpecker
Screech Owl
Robin
Kingfisher
Bobwhite

Birds from the North that may spend the winter here:

Slate-colored Junco
Purple Finch
Thistle Bird
White-throated Sparrow
Tree Sparrow
Golden-crowned Kinglet
Brown Creeper
Pine Siskin
Red-breasted Nuthatch
Fox Sparrow
Winter Wren
Redpoll
Northern Shrike
American Crossbill
White-winged Crossbill
Evening Grosbeak
Long-eared Owl
Saw-whet Owl
Barred Owl

It is to be noted that of the last six or seven species mentioned, some may not be seen here for periods of at least five or six years. A few other winter birds, not mentioned above, may occasionally fly over the park, such as three or four species of gulls, and then there are also occasional visits of various of the larger hawks, especially the Red-tailed, the Red-shouldered, the Broad-winged, and Cooper's. In still another class are a few stragglers, mostly solitary birds, that for some unknown reason, choose to remain

behind when all their companions have gone farther south for the winter. As such may be mentioned the Catbird, Flicker, Hermit Thrush, Brown Thrasher, and possibly one or two others, but whether many of these less hardy birds survive till warm weather comes is something of a question.

Last winter was noticeable owing to the presence of a small flock of White-winged Cross-bills, a bird not reported here before for six or eight years, as well as for the total absence of any Chickadees. Robins were unusually well represented, a flock of six or seven being present and feeding chiefly on the fruit of the Cork-wood tree (*Phellodendron sachalinense*). Thunberg's viburnum (*V. dilatatum*) also furnishes an accessible food supply in the late winter and early spring along with the European barberry and various species of the honeysuckle family. A bird that once resided in the Garden but has not been noted for more than twenty years, I believe, is the Great Horned Owl. One certainly lived on the northeastern edge of the hemlock grove during the winter of 1899 and 1900.

R. S. WILLIAMS

NOTES, NEWS AND COMMENT

Miss A. M. Johnson, a former student at the Garden and now assistant in botany and plant pathology in the University of Idaho, was a recent visitor at the Museum Building and Experimental plots.

Dr. C. J. Humphrey, a government investigator stationed at Madison, Wisconsin, called at the Garden on September 10 and 11 to examine type specimens of resupinate polypores. He had just been on a visit to Canada to study timber rots with Professor Faull.

The New York Bird and Tree Club held an out-door meeting at the Garden on October 18, being conducted through the grounds by members of the Garden Staff, assisted by Dr. G. Clyde Fisher, president of the Club. After the basket luncheon, there was an interesting meeting in the Museum Building.

Dr. Murrill gave an address on edible and poisonous fungi before the artists and other nature-lovers of Woodstock, New

York, on the evening of September 3 at the summer home of Dr. and Mrs. John A. Kingsbury, who are members of the Yama Farms Mycological Club. Over a hundred species were gathered during the day to use in illustration, and four giant puffballs were growing within a few feet of the house. On the following day, Dr. Murrill went with Dr. Kingsbury and his family to Yama Farms on a tour of exploration. At Jenny Brook, they found many interesting things, among them a "fairy ring" of gemmed puffballs thirty feet in diameter, containing scores of unusually large specimens.

The following visiting botanists enrolled in the library during the summer: Professors L. H. Bailey and H. M. Fitzpatrick, Ithaca, N. Y.; Professor Don M. Benedict, Syracuse, N. Y.; Dr. P. L. Buttrick, New Haven, Ct.; Dr. Norman M. Grier and class, Cold Spring, Harbor, L. I.; Mr. John M. Fogg, Jr., University of Pennsylvania; Miss D. K. Hughes, Miss Minnie W. Taylor, Mr. W. W. Ashe, Dr. Edgar T. Wherry, and Prof. F. Lamson-Scribner, Washington, D. C.; Prof. W. C. Coker, Chapel Hill, N. C.; Dr. H. L. Blomquist, Durham, N. C.; Mr. H. Teuscher, Lisle, Ill.; Dr. Nora E. Dalbey, Manhattan, Kansas; Prof. John T. Buchholz, Fayetteville, Ark.; Prof. Clifford H. Farr, Iowa City, Iowa; Prof. Geo. L. Fisher, Houston, Texas; Mr. Arthur S. Fairchild, St. Thomas, W. I.; and Dr. Ralph R. Stewart, Gordon College, India.

Meteorology for August. The total precipitation for the month was 1.21 inches. The maximum temperatures recorded for each week were *94° on the 5th*, 93° on the 7th, 92° on the 15th and 85° on the 25th. The minimum temperatures were 59° on the 2nd, 55.5° on the 10th, *49° on the 18th* and 54° on the 23rd.

Meteorology for September. The total precipitation for the month was 3.33 inches. The maximum temperatures recorded for each week were *88° on the 3rd*, 83° on the 10th and on the 13th, 84° on the 19th and 86.5° on the 25th. The minimum temperatures were 58° on the 9th, 45° on the 15th, *44° on the 18th* and 50.5° on the 30th.

ACCESSIONS

Museums and Herbarium

300 specimens of flowering plants from New Jersey and southern New York. (Collected by Dr. H. M. Denslow.)

36 museum specimens from Florida. (Collected by Dr. J. K. Small and Mr. J. W. Small.)

1548 specimens of flowering plants from the Old World and the New. (By exchange with the Jardin des Plantes, Paris.)

1 specimen of *Erodium cicutarium* from North Carolina. (Given by Mr. A. D. Huger.)

4 specimens of *Iris* fruits. (Given by Dr. E. T. Wherry.)

1 drawing of the flower-parts of *Iris caroliniana*. (By exchange with the Herbarium, Harvard University.)

1 specimen of *Iris* from South Carolina. (By exchange with the Charleston Museum.)

1 specimen of *Lacinaria* from Florida. (By exchange with the Office of Economic and Systematic Botany, Bureau of Plant Industry, Washington, D. C.)

2 specimens of Hepaticae from Manitoba. (Given by Professor C. W. Lowe.)

1 specimen of *Lejeunea patens* from Maine. (By exchange with Miss Annie Lorenz.)

8 specimens of Hepaticae from California and New Hampshire. (Given by Miss Caroline C. Haynes.)

1 specimen of *Nostoc muscorum* from Mexico. (Given by Dr. Homer D. House.)

69 specimens of marine algae from China. (Given by Mr. N. H. Cowdry.)

1 specimen of *Liagora farinosa* from Bermuda. (Given by Dr. A. B. Hervey.)

1 specimen of *Lophozia Mildeana* from Florida. (Given by Mr. Severin Rapp.)

2 specimens of *Riella numidica* from Algeria. (Given by Professor L. Trabut.)

2 specimens of *Neomeris van Bosseae* from Tahiti. (By exchange with Professor W. A. Setchell.)

2 specimens of Hepaticae (*Riccia fluitans* and *R. Frostii*) from China. (Given by Mr. N. H. Cowdry.)

673 specimens of fungi from Porto Rico. (By exchange with the University of Illinois.)

144 specimens of mosses from Juan Fernandez and Easter Island. (Collected by Dr. Carl Skottsberg.)

5000 specimens of fungi, mosses, ferns, and flowering plants from Porto Rico. (Collected by Dr. and Mrs. N. L. Britton and Dr. Fred J. Seaver.)

80 specimens of fungi from Hawaii. (By exchange with the University of Illinois.)

1 specimen of *Trillium pusillum* from Arkansas. (By exchange with Professor J. T. Buchholz.)

26 photographs of old paintings of plants at Kew. (Acquired from Mr. N. E. Brown.)

Plant and Seed Accessions

2 clumps of *Dahlia* roots, 1 variety. (Given by Mr. Myron E. Douglas.)
2 *Dahlia* roots, 2 varieties. (Given by Mr. A. Hentschel.)
2 *Dahlia* roots, 2 varieties. (By exchange with Mrs. Charles H. Stout.)
1 clump of *Dahlia* roots, 1 variety. (Given by Mrs. Theron G. Strong.)
1 *Dahlia* root. (By exchange with Miss Margaret S. Brown.)
1 *Dahlia* root. (Given by Mr. William Steel.)
1 *Dahlia* root. (By exchange with Dr. W. A. Murrill.)
1 *Dahlia* root. (By exchange with Dr. Edwin Marquand.)
12 plants for Iris Garden. (Given by Mr. J. Marion Shull.)
61 plants for Iris Garden. (Given by Mr. R. S. Sturtevant.)
98 plants of chrysanthemums for Horticultural Garden. (Given by The Chrysanthemum Society of America.)
3 plants of Roses. (Given by Mrs. M. J. Fox.)
21 plants for Iris Garden. (Given by Mr. Frank W. Campbell.)
1 plant for Conservatories. (Given by Mrs. Bertha L. Goimd.)
3 plants of *Calla Elliottiana* for Conservatories. (Given by John Lewis Childs, Inc.)
7 plants for Iris Garden. (Given by Mr. Frank Koehler.)
1 plant of *Persea Persea*. (Given by Miss Everett.)
5 plants for Iris Garden. (Given by Forest Heights Garden.)
18 plants for Iris Garden. (Given by Mrs. C. S. McKinney.)
5 plants for Iris Garden. (Given by Bobbink & Atkins.)
1 plant of *Dracaena* for Conservatories. (Given by Mrs. S. Gross.)
27 plants for Iris Garden. (Given by Mr. John C. Wister.)
1 plant for Conservatories. (Given by Mr. Geo. Johnson.)
1 plant of *Elaeagnus pungens* for Conservatories. (Given by Mrs. Chas. H. Stout.)
1 plant for Conservatories. (Given by Mrs. H. W. Rutherford.)
1 plant for Herbaceous Grounds. (Given by Mr. Ludwig Manz.)
102 plants for Decorative Planting. (Purchased.)
13 plants of water lilies. (Purchased.)
1 plant of *Hymenocallis* from Arkansas. (Collected by Mr. H. S. Wheeler.)
31 plants from Porto Rico. (Collected by Dr. & Mrs. N. L. Britton.)
1 plant of *Opuntia* from Georgia. (Collected by Mr. F. L. Reichert.)
1 plant of *Opuntia* from Georgia. (Collected by Mrs. Marquand.)
38 plants from Florida. (Collected by Dr. J. K. Small.)
2 plants for Nurseries. (By exchange with Dr. E. T. Wherry.)
39 plants from Florida. (By exchange with Rev. Father Jerome.)
1 plant of *Hymenocallis*. (By exchange with Mrs. Lewis Simons.)
3 plants for Conservatories. (By exchange with R. Runyon.)
14 plants for Conservatories. (By exchange with Mr. D. W. Gross through Dr. J. K. Small.)
1 plant for Rock Garden. (By exchange with Dr. F. W. Pennell.)
16 plants for Conservatories. (By exchange with U. S. National Museum through Dr. J. N. Rose.)

2 plants for Conservatories. (By exchange with Mr. J. T. Buchholz.)
7 plants for Conservatories. (By exchange with Royal Botanic Garden Kew.)
7 plants for Conservatories. (By exchange with Prospect Park, of Brooklyn.)
10 plants for Conservatories. (By exchange with Dr. E. J. Palmer through Dr. J. K. Small.)
15 plants for Nurseries. (By exchange with Prof. D. S. Johnson.)
17 plants for Conservatories. (Given by Federal Horticultural Board)
880 plants derived from seed.
6 packets of seed. (Given by Mr. Joseph Paquet.)
4 packets of seed from India. (Given by Miss Mary C. Bell.)
7 packets of seed. (Given by Mrs. W. H. Peckham.)
2 packets of seed from Porto Rico. (Collected by Mrs. N. L. Britton.)
2 packets of seed from Florida. (Collected by Dr. J. K. Small.)
1 packet of seed. (Purchased.)
5 packets of spores from France. (By exchange with Prof. Geo. Poirault.
4 plants for Iris Garden. (Given by Mr. Frank W. Campbell.)
4 plants for Iris Garden. (Given by Mrs. C. S. McKinney.)
16 plants for Iris Garden. (Given by Mrs. H. G. Lloyd.)
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2 plants for Conservatories. (Given by Mr. John Sommer.)
1 plant of *Hoya carnosa* for Conservatories. (Given by Mr. Ludwig J. Manz.)
28 plants for Iris Garden. (Given by Movilla Gardens.)
1 plant for Rock Garden. (Given by Miss Clara F. Stillman.)
1 plant of *Poinsettia* for Conservatories. (Given by Mr. D. M. McCormick.)
3 plants of *Pelargonium* for Conservatories. (Given by Miss B. Thomas.)
15 plants for Conservatories. (By exchange with Mr. H. Nehrling.)
37 plants of *Iris* for Nurseries. (By exchange with Dr. E. T. Wherry.)
12 plants for Conservatories. (By exchange with Mr. Antonie Blazic.)
1 plant of *Iris* for Nurseries. (By exchange with Trinity College.)
4 plants for Nurseries. (By exchange with Mr. M. C. Auld.)
1 plant for Conservatories. (By exchange with Smith College.)
9 plants for Conservatories. (By exchange with Mr. K. D. M. Simmon.)
14 plants of *Iris caroliniana* for Nurseries. (By exchange with Mr. D. W. Gross.)
1 plant for Conservatories. (By exchange with Miss Ruth Rose.)
5 plants for Conservatories. (By exchange with Father Jerome.)
1 plant of *Polypodium vulgare* for Rock Garden. (By exchange with Prof. L. Slater.)
4 plants for Nurseries. (By exchange with Dr. E. J. Palmer.)
7 plants for Conservatories. (By exchange with U. S. Dept. of Agric.)

1 plant of *Peperomia* for Conservatories. (By exchange with Prof. Roig.)
1 plant for Conservatories. (By exchange with Brooklyn Botanic Garden.)
6 plants for Conservatories. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)
5 cuttings for Nurseries. (By exchange with Mr. D. S. George.)
3 plants for Conservatories. (Collected by Dr. C. T. Simpson.)
1 plant for Conservatories. (Collected by Dr. W. H. Buswell.)
6 plants for Rock Garden from Michigan. (Collected by Dr. H. A. Gleason)
1 plant of *Rhipsalis cassytha* from Florida. (Collected by Mr. C. A. Mosier.)
2 plants of *Populus heterophylla.* (Collected by Dr. A. B. Stout & Dr. A. Hollick.)
7 plants of *Sansevieria* from West Indies. (Collected by Mr. Geo. H. Clarke.)
6 plants for Nurseries. (Collected by Dr. A. Hollick.)
24 plants for Herbaceous Grounds. (Collected by Miss M. E. Eaton.)
6 plants from Florida. (Collected by Mosier & De Winkeler.)
713 plants derived from seed.
1 packet of seed. (Given by Mr. Chas. W. Jacob & Allison.)
3 packets of seed. (Given by Mr. Wm. Sinclair.)
28 packets of seed. (Purchased.)
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3 packets of seed. (By exchange with Prof. Geo. Poirault.)
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NEW YORK BOTANICAL GARDEN
Bronx Park, New York City

Vol. XXIV December, 1923 No. 288

JOURNAL

OF

The New York Botanical Garden

EDITOR

HENRY ALLAN GLEASON

Curator

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PRICE $1.00 A YEAR; 10 CENTS A COPY

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AT 8 WEST KING STREET, LANCASTER, PA.
INTELLIGENCER PRINTING COMPANY

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JOURNAL
OF
The New York Botanical Garden

Vol. XXIV December, 1923 No. 288

BOTANICAL OBSERVATIONS IN NORTHERN MICHIGAN

The state of Michigan is characterized by two distinct and important types of vegetation, the hardwood, broad-leaved forest of the central and south-central United States, and the evergreen, needle-leaved forest of the northern states and Canada. The former is predominant in the southern half of the lower peninsula, where the climate is not essentially different from that of the vicinity of New York City. In the northern part of the state the two forest types meet, and here they have for centuries waged a war for supremacy. Ecologists aver that the struggle has slowly but surely turned in favor of the beech, maple, and oak of the southern forest, which have gradually pushed farther and farther to the north, while the pine, spruce, and fir of the northern forest have steadily retreated northward toward Canada.

Little evidence of this botanical contest now remains. The armies of both belligerent forests have been sadly decimated by a third and much more powerful force—man, armed with the axe, the circular saw, and the railroad. His onslaught fell first on the extensive forests of white pine and Norway pine, and from 1880 to 1890 millions of feet of lumber were manufactured and shipped. As the pine forests disappeared and the demand for lumber still increased, the beech and maple were similarly attacked. As a result of nearly half a century of lumbering, almost none of the original magnifcent forest is left.

The University of Michigan has located its Biological Station on a tract of some three thousand acres of cut-over land, situated on the shores of Douglas Lake and Burt Lake, about fifteen miles south of the Straits of Mackinac. Courses of instruction

in botany and zoology have been offered every summer for the past fifteen years, and numerous graduate students find there excellent opportunities for research in many different lines. Any botanist finds interest in noting the effect of lumbering and fire on the forest vegetation, and soon becomes an ardent conservationist, if he was not one before.

The pine land is generally poorly adapted to agriculture and has been allowed to stand continuously idle. After lumbering, the land is left a jungle of brush heaps and soon grows up to dense thickets of aspen, birch, and pin cherry, with an almost continuous ground cover of bracken fern. Always enough crooked or partially decayed trees are left standing to seed the cut-over land, so that the development of a new generation of pines begins immediately. Thousands of pine seedlings appear and grow rapidly. Annual increments of three feet are frequent, and the aspen thickets would soon be replaced by young pine forest if it were not for fires. Fires originate through the carelessness of hunters and fishermen, from temporary camps, from attempts of the farmers to clear land, from sparks from locomotives, and doubtless in other ways as well. In any case, they occur somewhere every year and in such dry seasons as the summer of 1923 they become common and widespread. On one day twelve fires were counted in a drive of only seven miles. They are brush fires, feeding on the ground litter and the self-pruned branches of the aspens, but they are hot enough to kill the aspens and the young pines. They favor the germination of aspens, and the following year another generation promptly springs up, while the trees killed by the last fire soon fall to the ground to furnish a new supply of fuel. So the dismal cycle is continued and has continued for years, and doubtless will continue for years to come, until a better public spirit has developed.

Given protection from fire, the young pines continue their rapid growth and replace the aspens at their death. The aspen is a short-lived tree, at least under these circumstances. It may be that the sandy soil is too poor to permit their larger growth, it may be due to their crowding in thickets or to some water relation, but it is evident that most of them die naturally after about twenty-five years, unless killed by fire before that time. On the University property, which has been repeatedly devastated by fires, two small areas have escaped for the past several

years. On one of them the last fire was apparently in 1901. There the aspens form a low forest, beneath which fine young pines are growing vigorously. In a few years more the aspens will be dead, and the pines will grow faster with the better light. Possibly ten years will place this area beyond danger from brush fires. On the second, the change from aspen to pine has taken place during the past ten years. The old aspen trees have already decayed and are replaced by a thrifty growth of healthy pines, already beyond danger from the ordinary brush fire.

Such natural replacement depends obviously on the presence of old trees for seed. In places where the lumberman's axe or repeated and severe fires have taken all the pines, reforestation will be very slow. In such cases the planting of young pines and their protection for a few years would speedily produce a forest which should be a steady source of revenue. Cut-over pine land has little agricultural value, being composed largely of pure sand, and pine is probably the most profitable crop which it will produce. The lumber companies abandoned it after taking off the lumber, and thousands of acres have reverted to the State for non-payment of taxes. It has been computed that this public land, if properly reforested, would yield enough profit annually to relieve the State of all taxation. Instead it now yields no revenue at all, and in some counties so much land belongs to the State that the little taxable land left is barely sufficient to carry the expenses of the local government. Probably no better argument for a vigorous policy of forest conservation and reforestation can be found in the eastern United States than these hundreds of miles of aspen thickets, dreary, monotonous, valueless, but capable of producing millions of feet of the finest quality of white pine lumber.

The condition in the hardwood forests is somewhat different. Such forests usually occupy a better type of soil, with fair or good agricultural possibilities. There is of course little reason for using such land for forest if a greater revenue can be obtained from agriculture. But the hardwood forest, as well as the pine, does need some sort of protection from an esthetic, scientific, and historical standpoint. Michigan's forests made her famous and wealthy, and were the foundation on which scores of private fortunes were built. If Mackinac Island deserves protection for its historic interest, or the Yosemite for its beauty, or the bison

for its scientific interest, surely the Michigan forests are equally deserving.

The destruction of a forest means far more than the removal of the trees. It also means the immediate extinction, for that locality, of numerous other plants and animals. The coral-root, the rattlesnake plantain, the arbutus, and many other wild flowers of charm and interest; the salamander, the raccoon, the pileated woodpecker, and numerous other animals disappear. The trees may be re-established, but these smaller denizens of the forest will not return for years, if at all.

Certain species of plants, on the other hand, flourish better after a reasonable amount of forest clearing. This statement applies not merely to the usual clearing plants, such as the two fireweeds or the raspberry, but to various species of beauty and rarity as well. It has been particularly interesting to watch these developments during twelve years' experience with the region.

The bogs of northern Michigan shelter a surprising number of orchids, most of which demand a fair amount of light for their successful growth, while the dense forest of arbor-vitae is so dark beneath that scarcely any vegetation can grow there. When the larger trees are removed, logging roads are opened in all directions through the bog, and these are at once occupied by thousands of plants, among which may be found far more of the rarer species or of those with beautiful flowers than in the bog itself. In late June every railroad track, as it crosses an arbor-vitae bog, is bordered with hundreds of plants of the wood lily (*Lilium philadelphicum*). Originally it seems to have grown best at the very margin of these swamps where they open out on the sandy beach of a lake. It is quite probable that they have increased a hundred-fold since man began his operations in that region.

But numbers may be a disadvantage, for the very abundance of these plants leads to their downfall. In one bog near the Biological Station, every logging trail was formerly brightened with great clumps of the showy lady-slipper. It was estimated that fifteen thousand plants bloomed there in 1911. In 1923, they bloomed only singly, or rarely by two's or three's, and there were probably not more than a thousand in all, mostly back in the least accessible parts of the bog. The others have been ex-

terminated by flower pickers. In the same place, the less attractive yellow lady-slippers are practically undiminished in abundance. Rumors exist of a commercial dealer who bought a prodigious quantity of wood lily bulbs from the same region.

In the meantime, the stemless lady-slipper has been actually increasing. It was first seen in the aspen thickets in 1912, when two individuals were found by an observant student. Since then it has spread rapidly, until statistical studies show that it now averages about forty-five plants or colonies to the acre. It blooms before the opening of the tourist season, and one frequently finds its ripening capsules, sometimes two inches long and on stems sixteen inches high, from which the light seeds are scattered far and wide by the wind.

A few small tracts of uncut hardwood may be found in almost every neighborhood, serving as a source of firewood, and gradually diminishing in size from year to year. While such groves give a fairly good idea of the forest cover itself, they are of little value to one interested in the ground vegetation, for in most instances the groves serve also as pasture for the pigs. These animals seem to subsist on the roots as much as on the leaves and stems, and the herbaceous vegetation is practically destroyed in a short time. I looked in vain for the wild leek (*Allium tricoccum*) where it was abundant six years before.

By great good fortune, opportunity arose to visit, in company with Dr. L. R. Dice, of the Zoological Museum, the largest virgin tract of hardwood forest now standing in the lower peninsula. Seven square miles of it are still in their primeval condition, with the great trees of sugar maple, beech, yellow birch, hemlock, and elm towering a hundred feet and more in the air and creating a noonday twilight beneath. The largest of these in trunk diameter is the elm, which may exceed five feet, while sugar maple and beech, although more abundant, are smaller, because of their slower growth. The maximum age appears to be about 350 years. Death of the trees seems to be caused usually by wood-destroying fungi, especially various species of polypores, which are very abundant. The dead trunks ultimately fall, excavating a hole where they stood, and piling up a heap of soil around the mass of roots. Then the work of decay goes on apace until nothing remains of the tree except a long ridge of humus, a pile of earth, and a pit to mark its former

site. The floor of the forest is a continuous series of these ridges, heaps, and pits, so that travel is slow and sometimes treacherous.

The forest floor during the late summer is covered by an unbroken sheet of greenery. Of the hundred species of plants or more, not one is in bloom. A few rare individuals of aster and goldenrod exist, which normally flower at this season, but under these deep shades they are sterile. The numerous fruiting plants of raspberry, gooseberry, arrowwood, partridge-berry, and many other smaller plants indicate that flowers are common enough in the proper season. It is probable that the prevernal season of April and May finds these forests gay with bloodroot, Dutchman's breeches, and anemones, but no trace of these plants remains by late summer. The wild geranium, the blue cohosh, and the false mitrewort still stand; sweet Cicely, bedstraw (*Galium triflorum*), and Indian turnip are abundant; two kinds of wake-robin (*Trillium cernuum* and *T. grandiflorum*) set their fruit freely, maidenhair ferns are common, and the spinulose shield fern and the wild sarsaparilla (*Aralia nudicaulis*) are ubiquitous. Decayed logs are marked by patches of enchanter's nightshade and wood sorrel.

All these herbaceous plants are surrounded and frequently concealed by an unbroken mass of seedling maple trees. The sugar maple seems to set seed freely and every year, and its seedlings exist by the million. A fair estimate shows ten of them to every square foot of the forest. Seedling birches and elms are common, but the beech germinates freely only on the sides and bottoms of ravines, while hemlock seedlings are not seen at all. The countless number of young maple trees gives an interesting insight into the struggle for existence in the forest and shows in a striking way the great mortality among the young plants. If a mature tree is assumed to live 350 years and to occupy 400 square feet of space, and these figures are approximately correct, there spring up beneath it during this one generation no less than 1,400,000 maple seedlings. Of these the vast majority succumb during or at the end of their first year, and only 70,000 persist during the second year; 1400 live to be ten years old, 35 grow to be tall slender saplings, dying at about 50 years of age, two attain an age of 150 to 200 years and a height of 60 to 80 feet, and one eventually becomes a forest veteran. So one may find beneath a mature tree, in any single year, some 4000 seedlings, 400 two-

year seedlings, 40 small plants two to five feet high, five saplings, and one good-sized tree waiting to replace the veteran when it dies.

The facts that there are no hemlock seedlings, and have not been during the past twelve years, notwithstanding annual variations in temperature and rainfall, and that young hemlock trees are very rarely found, lead inevitably to the conclusion that the hemlock will disappear as a component of these forests with the death of the present generation of veterans. And this, in turn, encourages the speculation that 350 years ago, when the present mature trees were seedlings, the environmental conditions must have been otherwise, and distinctly more favorable to hemlock than at present.

This forest area lies on the crest of the high morainal region which covers some thousands of square miles in the upper part of the lower peninsula of Michigan, and reaches altitudes of well over 1300 feet. This plateau descends to Lake Michigan in a steep escarpment some 600 feet high in Charlevoix County, but is remarkably level on top. Farther south it is occupied largely by the well-known jack-pine plains, but at this northern end its original vegetation was apparently hardwood and white pine. As one passes eastward through the great hardwood forest, one reaches the familar type of cut-over land covered with aspens and interspersed with a few farms, and this type of landscape extends east as far as Gaylord.

We turned north from Gaylord toward the northern edge of the plateau, where the well-made road commands splendid views of miles of rolling, forested country, and again west approximately along the northern side of the escarpment. Here the country is unusually rough and broken. The valleys contain peat bogs and picturesque ponds and lakes, overshadowed by high morainal hills and fed by spring water seeping out from the high plateau to the south. In this plateau region surface drainage is reduced to a minimum. Rain water percolates at once into the sandy soil and emerges through springs into various trout streams flowing out from its base. At the remote, almost inaccessible, but remarkably beautiful Thumb Lake, another square mile of virgin hardwood forest still stands, and other extensive areas in the vicinity are now being cut. This tract, being more rolling, with a better supply of subterranean moisture, supports a better

growth of beech than the forests of the high plateau, and also contains a few herbaceous species not seen elsewhere.

Two other interesting excursions were made to the State Game Refuge, which occupies a tract of some eight thousand acres along the shore of Lake Michigan west of Mackinaw City. A crude road, barely passable for motor cars, has been constructed into the preserve from the abandoned lumber town of Cecil Bay, following closely the shore of the lake. On both trips to the Refuge, camp was made on the shore of Big Stone Bay, which has served as the center for the scientific exploration of the region for the past twelve years.

The animal life in the Refuge includes a continually increasing herd of deer, a few bear and otter, and numerous fox, beaver, badger, raccoon, porcupine, snow-shoe rabbit, and various smaller species. Aquatic birds are plentiful along the shallow shores.

The plant life is not less interesting. Destructive fire has not crossed the Refuge, according to local reports at least, since 1837, although much lumber was cut before the land passed under the control of the State. Most of the tract is comparatively low, rising only a few feet above the present level of the lake, and a considerable part of it owes its origin to wave action. Immediately along the shore are low dunes, seldom over thirty feet high, with an interesting assemblage of the usual dune plants of the inland lakes. Beachgrass (*Ammophila*), wild rye (*Elymus*), and sand cherry are the common sand-binding plants on the dunes, and they are accompanied by an array of other species, many of which are peculiar to the shores of the Great Lakes, or at least do not occur along the dunes of the Atlantic ocean. Among these are a goldenrod (*Solidago Gilmani*), wild tansy (*Tanacetum huronense*), and thistle (*Cirsium Pitcheri*). The older dunes are held by mats of bearberry and creeping juniper (*Juniperus horizontalis*) and the round thickets of the low juniper (*J. sibirica*), with occasional trees of balsam and pine.

Behind these dunes of recent origin lies a dense forest of arbor-vitae, in which the trees are so crowded that progress through them is slow and difficult. Here the shade is so dense that herbaceous plant life is almost or completely absent. *Aster macrophyllus* is the commonest species. The arbor-vitae forest occupies a series of parallel beach ridges, marking the progress of the lake shore in its recession from the post-glacial Lake Nipissing

to the modern Lake Michigan. These ridges are broad and flat, separated by narrow valleys, and each successively older ridge is a few feet higher. On the summit of the drier ridges the pine-drops (*Pterospora Andromedea*) may be found, and there the forest shows an admixture of pine and balsam.

Behind this series of ridges, at what was formerly the shore of Lake Nipissing, lies a series of high sand dunes, formed by the waters of that prehistoric lake, and far exceeding the dunes of the present lake in size. Completely invisible at a short distance through the dense forest of arbor-vitae, they give the explorer a distinct surprise when he suddenly reaches a precipitous slope, and the surprise is heightened when the dune is discovered to be a hundred feet high.

On the slope of the dune the vegetation changes immediately to the familiar aspen thickets, underlaid with bracken fern and blueberry. The original pines were removed from these hills years ago, but are again becoming re-established. A few more years of protection by the state will see them completely re-forested with white and Norway pine.

Reaching the top of the first dune, one sees with interest that there is a complex of dunes before him, all with precipitous slopes, and most of them separated by peat bogs. The elevation permits a general bird's-eye view of the whole preserve, and the four association-types of the region can be distinguished for a long distance: mile after mile of somber green coniferous forest, long curving dunes covered with the light green of the aspen, peat-bogs between them colored brown with the leather-leaf and dotted with the emerald of the tamarack, and a narrow strip of yellow sand marking the present beach of Lake Michigan. Untouched by fire and unscarred by man, at least for many years, the whole scene gives a charming picture of vegetation in its virgin state, and one which can scarcely be matched at the present time in the state.

Westward the Game Refuge stretches out along the narrow Temperance Point, which projects four or five miles into Lake Michigan. This point has been built up by the well-known processes of wave action, and presents hooks sand spits, beach pools, sand bars, and islands in all stages of formation.

At one point waves have until recently flowed entirely across the point. Here sand deposits have isolated a shallow beach

pool, inhabited by the bulrush (*Scirpus validus*) and the three-square rush (*Scirpus americanus*), and bounded by a broad beach but little above the lake level. This beach forms a natural botanical garden, which is particularly gay with flowers during late summer. Of the numerous species represented, three deserve special mention. Around the scattered rocks piled on the beach are small mats of *Selaginella apus*, frequently associated with the rare related species *S. selaginoides*. On the mud flats between the rocks are thousands of pale yellow-green rosettes of the butter-wort (*Pinguicula vulgaris*), an insectivorous plant of northern distribution.

Encroachment of the forest on the new beach begins with the appearance of the shrubby cinquefoil and the buffalo berry along the curving lines of larger boulders, marking the limit of wave and ice action at some former time. These are soon followed by the arbor-vitae, while a treeless area still remains back of this beach ridge, slightly lower in general elevation, in front of the forest proper. The formation of this narrow beach ridge through the exclusion of wave action, and its colonization by plants, represents in a small way the past history of the larger post-Nipissing beach ridges described above.

One object in the trip to this game preserve was the finding of plants of the lake-shore iris (*Iris lacustris*) in their natural habitat. They were found, growing by the thousands, with their narrow green leaves so close together that the plant formed an actual sod on the ground. Contrary to expectations, this dwarf iris does not grow directly on the lake beach, but on the densely shaded beach ridges. Here it occupies a soil composed of a foundation of small stones and coarse gravel, the interstices of which are filled with leaf mold. No fruiting specimens were seen, but it is said to flower abundantly. A number of specimens were safely transplanted to New York and are now growing in the herbaceous collection at the Botanical Garden.

Completely surrounded by coniferous forest of the game preserve, and some miles away from any similar vegetation, lies a small tract of beech-maple forest, with a total area not exceeding forty acres. The herbaceous species of this forest are few in number and many of the commonest and most important species of the usual type are absent. Several of those present belong rather in the surrounding arbor-vitae forest, and the others,

with a very few exceptions, have seeds or fruits easily disseminated by wind or birds. This condition, and the small size of the deciduous trees in comparison with the hemlocks, suggest that this tract is a recent development, derived by an immigration into a favorable spot of certain species from the extensive hardwoods of the morainal hills three or four miles south.

H. A. GLEASON.

FRANCIS ALEXANDER SCHILLING

Colonel Francis Alexander Schilling, Custodian of the Museum Building of the New York Botanical Garden, died at his home near the Garden on November fourth, nineteen hundred and twenty-three. He was in his ninety-first year, having been born May twenty-seventh, eighteen hundred and thirty-three, in Lauterburg, Alsace.

He came to New York when about eighteen years of age. His military service was nearly continuous over many years from his enlistment as a private in the twentieth New York regiment of militia in eighteen hundred and fifty-one, rising through all ranks to that of Brevet Colonel, eighth regiment in eighteen hundred and seventy-nine. During the Civil War he served as a Signal Officer, Regimental Adjutant and Captain in the fifty-fifth regiment, and participated in the battles of Yorktown, Williamsburg, Fair Oaks, Malvern Hill, Second Bull Run, Fredericksburg and Gettysburg. On March first, nineteen hundred, soon after work on the development of the Garden was commenced, he was appointed Superintendent of Buildings and Grounds, and took an active and highly efficient part in the construction and care of buildings, roads and paths. His printed reports of this work will be found in successive issues of the Garden Bulletin until nineteen hundred and ten, when he was transferred to a new position, that of Custodian of the Museum Building, and this he occupied continuously to the day of his death.

Colonel Schilling was esteemed and beloved by all who knew him, as an officer, as a friend and as a man.

> Resolved: That the Board of Managers deplore their loss and that of the Garden, in the death of one of its oldest and most faithful officials, and

Resolved: That the foregoing preamble and resolution be printed in the Garden Journal, and that a copy be sent to his bereaved family.

N. L. BRITTON,
Secretary.

Approved by the Board of Managers of the
New York Botanical Garden,
November 15th, 1923.

PUBLIC LECTURES DURING DECEMBER

The December course of public lectures and demonstrations was given in the Central Display Greenhouse of Conservatory Range 2, on the following subjects:

Dec. 1.	"Australian plants."	Mr. K. R. Boynton.
Dec. 8.	"Air-plants."	Dr. H. A. Gleason.
Dec. 15.	"When a tropical vegetation flourished in Alaska."	Dr. Arthur Hollick.
Dec. 22.	"Ferns of the Tropics."	Dr. M. A. Howe.
Dec. 29.	"Cocoa and chocolate."	Dr. W. A. Murrill.

NOTES, NEWS AND COMMENT

One of the maidenhair-fern trees (*Ginkgo biloba*), located near the Mosholu Parkway Entrance to the Garden, bore about a hundred fruits this fall. They began falling about November 10. This is apparently the first instance of these trees fruiting on the premises of the Garden. The maidenhair-fern tree, now frequently planted in the United States, is a native of eastern Asia and the sole surviving species of its genus, family, and order, which formerly included twenty or more species of worldwide geographic distribution.

Cones appeared for the first time this year on our specimens of Alcock's spruce, lace-bark pine, and dwarf Japanese red pine, all of which are represented by young trees in the Pinetum. The great Bhotan pines are also bearing heavily and their long gray-green cones are very attractive.

Three fruits ripened this year on the Chinese wax gourd, *Benincasa cerifera*. They are cylindric, about one foot long by half as thick, with white flesh and seeds.

Dr. John K. Small, head curator, left for Florida, November 20, for further botanical exploration, in the course of which he expects to cover several thousand miles in northern Florida and the peninsula. The principal objects of the trip are the securing of living material of the rare endemic plants of the Apalachicola River region and the gathering of iris plants to supplement his collection of the iris of the coastal plain now growing at the propagating houses. Studies will be continued on the zamias, cacti, and spider lilies now installed in the reservations of Mr. Charles Deering near Miami.

An excellent set of seventy sample specimens of species of *Clavaria*, the principal genus of the coral-fungi, has recently been sent to the Garden herbarium by Professor W. C. Coker, of the University of North Carolina, who is the author of the latest book on this interesting family of fungi. These specimens will be very valuable for determining new material in this group.

The tulip planting season ended November 15, when a total of 80,550 bulbs had been placed in the ground. These are all the gift of the General Bulb Growers' Association, Haarlem, Holland, and include all standard types and varieties. Approximately half are Darwins, in 65 varieties, and occupy the flower beds of the Horticultural Grounds. The rest include Breeders, Cottage, and Double and Single Earlies in 85 varieties, and are planted in the court of Conservatory Range 1.

The November Conference of the scientific staff and registered students of the Garden was held in the lecture hall of the Museum Building on the afternoon of November 7. Dr. A. B. Stout reported with lantern slide illustrations on "The flower mechanism of avocados with reference to the development of fruit." It is planned to publish an abstract of this report in a later number of this Journal.

Meteorology for October. The total precipitation for the month was 4.29 inches, all of which (except slight traces) fell after the day of the 14th. The maximum temperatures recorded for each

week were *78° on the 2nd*, 74° on the 10th, 72° on the 20th and 68° on the 24th. The minimum temperatures were 37° on the 7th, 43° on the 9th, 40° on the 17th and *32.5° on the 27th*. There was a light killing frost in limited areas during the night of the 7th, when the temperature was 37°, and also on the morning of the 27th, when the temperature recorded at the station was 32.5°, but neither of these injured the dahlias in the border planting.

Dr. Charles Frederick Millspaugh, Curator of the Department of Botany in the Field Museum of Chicago, since 1894, died on September 15th in his seventieth year. Dr. Millspaugh, who was born in Ithaca, N. Y., and was a nephew of Ezra Cornell, founder of Cornell University, was for several years in early manhood a practising physician at Binghamton, N. Y. Later he was for a short period botanist at West Virginia University. He devoted much time to travel and botanical exploration, and made collections in Mexico, Brazil, and numerous islands of the Antillean region. Among his best known publications are "American Medical Plants," "Flora of West Virginia," "Flora of St. Croix," "Plantae Yucatanae," and (with N. L. Britton) "The Bahama Flora." He accompanied New York Botanical Garden expeditions to the Bahamas in 1904, 1905, and 1907, and he was a frequent visitor at the Garden. Dr. Millspaugh combined an artistic touch with practical ingenuity. His display of plants and plant products in the Field Museum attracted great attention and was a model for other similar institutions throughout the world. In perpetuation of his memory one of the halls in the Field Museum is to bear his name and further developments of the botanical department are to follow plans left by him.

ACCESSIONS

Museums and Herbarium

109 specimens of flowering plants from North America. (By exchange with the Missouri Botanical Garden.)

1 specimen of *Trifolium hybridum* from Florida. (Given by Mr. Severin Rapp.)

1 specimen of *Anthericum* from Texas. (By exchange with the United States National Museum.

50 specimens of flowering plants from Victoria, Australia. (By exchange with National Herbarium of Victoria.)

20 specimens of flowering plants from Vermont. (Given by Dr. H. M. Denslow.)

1 specimen of *Tagetes minuta* from California. (Given by Professor C. S. Pomeroy.)

1 specimen of *Perularia flava* from Indiana. (Given by Mr. C. C. Deam.)

3 photographs of type specimens of *Lupinus*. (By exchange with the United States National Museum.)

8 specimens of Hepaticae from El Salvador. (By exchange with the United States National Museum.)

11 specimens of Hepaticae from Connecticut and Vermont. (By exchange with Miss Annie Lorenz)

20 specimens of marine algae from Puget Sound. (Given by Mr. J. M. Grant.)

5 specimens of *Durvillaei Padina* from the Gulf of California. (By exchange with the University of California.)

4 specimens of *Corallina* and *Chara* from Anticosti Island. (Given by Mr. Frits Johansen.)

1 specimen of *Nitella opaca* from Newfoundland. (Given by Mr. Frits Johansen.)

5 photographs of old type specimens of *Aloe* and *Mesymbranthemum* at Kew. (Acquired from Mr. N. E. Brown.)

1 specimen of *Berteroa incana* from Indiana. (Given by Mr. A. A. Hansen.)

17 photographs of old cactus paintings at Kew. (Acquired from Mr. N. E. Brown.)

1 specimen of *Iris* from South Carolina. (Given by Miss Laura M. Bragg.)

126 specimens of flowering plants from Greenland. (By exchange with Dr. M. P. Porsild.)

1 specimen of *Yucca* from Colorado. (Given by Mr. John C. Johnson.)

5 specimens of flowering plants from Arkansas and Florida. (Given by Dr. R. M. Harper.)

22 specimens of flowering plants from Idaho. (By exchange with Mrs. M. E. Soth.)

1 specimen of *Oreocarya stricta* from Colorado. (Given by Mr. George E. Osterhout.)

30 specimens of mosses from Hispaniola. (By exchange with the United States National Museum.)

222 specimens of flowering plants from Colorado. (By exchange with the division of Drug, Poisonous, and Oil plants, Bureau of Plant Industry, Washington, D. C.)

1 specimen of *Spiridens Reenwardtii* from Philippine Islands. (By exchange with the Bureau of Science, Manila.)

341 specimens of orchids. (By exchange with the Royal Botanic Gardens, Kew.)

10 specimens of cacti. (By exchange with the United States National Museum.)

68 specimens of flowering plants (naturalized European species) from the Bronx. (Collected by Dr. John K. Small.)

1 specimen of *Cerastium velutinum.* (Given by Dr. Arthur Hollick.)

1 specimen of *Pecopteris* sp. (Carboniferous.) (By exchange with Miss Eda,M. Round.)

1 specimen of fossil wood of *Sequoia* (?). (By exchange with Mr. Chester A. Reeds.)

198 specimens of flowering plants from Alaska. (By exchange with Mr. J. P. Anderson.)

71 specimens of flowering plants from Utah and Montana. (By exchange with Professor A. O. Garrett.)

13 photographs of cacti. (By exchange with the United States National Museum.)

144 specimens of miscellaneous grasses. (By exchange with the Royal Botanic Gardens, Kew.)

2 specimens of *Cerastium vulgatum* from New York. (Collected by Dr. Arthur Hollick.)

9 specimens of *Trifolium* (naturalized species) from Georgia and Alabama. (By exchange with the Bureau of Plant Industry, Washington, D. C.)

2 specimens of fungi from Ontario. (By exchange with Professor John Dearness.)

200 specimens, "North American Uredinales" centuries 28 and 29. (Distributed by Elam Bartholomew.)

1 specimen of *Clathrus columnatus* from Georgia. (By exchange with Miss Margaret Brown.)

1 specimen of *Aurantiporellus alboluteus* from Colorado (Collected by Professor Ellsworth Bethel.)

3 specimens of polypores from British Guiana. (Given by the American Museum of Natural History.)

1 photograph of *Stropharia umbonatescens.* (Given by Prof. H. C. Beardslee.)

500 specimens of fungi from Florida. (Collected by Dr. W. A. Murrill.)

1 specimen of *Ophiobolus Cariceti* from New York. (Given by Mr. R. S. Kirby.)

2 specimens of *Riccia.* (By exchange with Professor Alexander W. Evans.)

16 specimens of flowering plants from New York. (Collected by Dr. Arthur Hollick.)

10 specimens of lichens from Kodiak, Alaska. (By exchange with Miss Ruth Mylroie.)

2 specimens of *Falcaria vulgaris* from New York. (Given by Mrs. Tessie K. Frank.)

2 photographs of type specimens of Water's "*Arethusa divaricata.*" (By exchange with Mr. Oakes Am s.)

7 specimens of *Cirsium* from Minnesota. (Given by Professor J. M. Holzinger.)

40 specimens of flowering plants from Wyoming. (Given by Professor J. F. Kemp.)

5 specimens of flowering plants from the Cedar Glades, Tennessee. (Given by Dr. R. M. Harper.)

6 specimens of flowering plants from Florida. (Given by Brother Hugh O'Neill.)

217 specimens of fungi from British Guiana. (By exchange with the University of Illinois.)

1150 specimens of lichens, ferns, and flowering plants from peninsular Florida. (Collected by Dr. John K. Small.)

36 photographs of living plants of *Mesembryanthemum*. (Acquired from Mr. N. E. Brown.)

107 specimens of fungi from Trinidad. (By exchange with the University of Illinois.)

1 specimen of *Oxyrhyncus volubilis*. (By exchange with the Bureau of Plant Industry, Washington.)

1 specimen of *Phyllosticta mida* from Pennsylvania. (By exchange with Dr. L. O. Overholts.)

204 specimens of fungi from British Guiana. (Collected by Professor F. L. Stevens.)

14 specimens of rusts from New York and New Jersey. (Given by Prof. H. S. Jackson.)

673 specimens of fungi from Porto Rico, Trinidad, British Guiana, and Hawaii. (Collected by Professor F. L. Stevens.)

26 specimens of fungi from British Guiana. (By exchange with the American Museum of Natural History.)

30 specimens, "Fungi Dakotenses" fascicle 22. (Distributed by Dr. J. F. Brenckle.)

40 specimens of rusts from Trinidad. (By exchange with Dr. Roland Thaxter.)

28 specimens of fungi from Panama and Costa Rica. (Collected by Prof. F. L. Stevens.)

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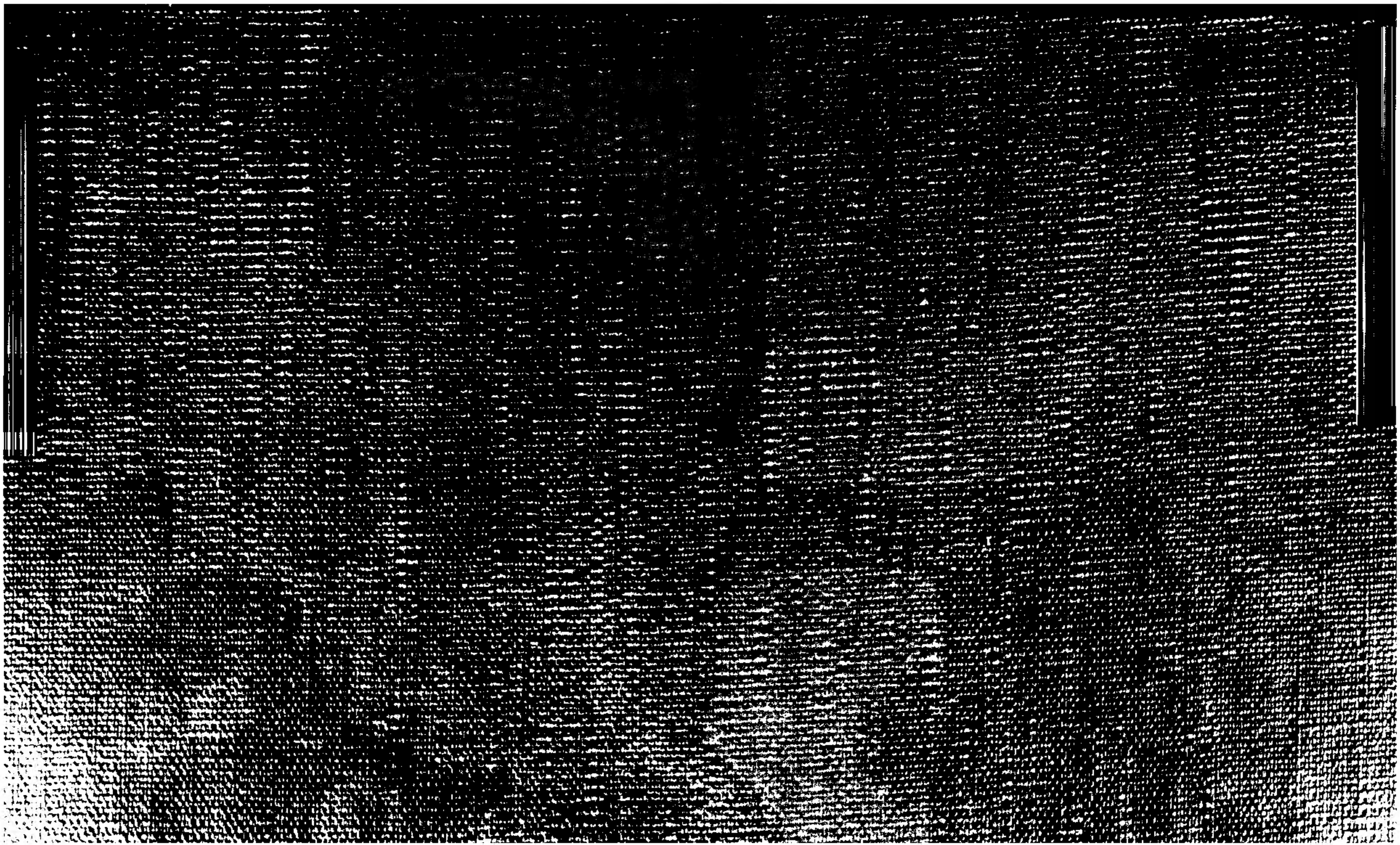
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